

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE		PAGE OF PAGES	
2. AMENDMENT/MODIFICATION NO.		3. EFFECTIVE DATE		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. (If applicable)	
6. ISSUED BY		CODE		7. ADMINISTERED BY (If other than Item 6)		CODE	
8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)				(X)		9A. AMENDMENT OF SOLICIATION NO.	
						9B. DATED (SEE ITEM 11)	
						10A. MODIFICATION OF CONTRACT/ORDER NO.	
						10B. DATED (SEE ITEM 11)	
CODE		FACILITY CODE					

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

- ☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:
- (a) By completing items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		(Signature of Contracting Officer)	

Item 14. Continued.

CHANGES TO THE SPECIFICATIONS.

- 1) New Sections - Add the following accompanying new sections, each bearing the notation "ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002," and add to the Table of Contents:

<u>Section No.</u>	<u>Title</u>
04100	MORTAR AND MASONRY GROUT
04255	MASONRY VENEER/STEEL STUD WALLS
04320	VENEER MASONRY SYSTEM
04340	REINFORCED CONCRETE MASONRY UNIT SYSTEM
05400	COLD FORMED METAL FRAMING

- 2) Replacement Sections - Replace the following sections with the accompanying new sections of the same number and title, bearing the notation "ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002."

<u>Section No.</u>	<u>Title</u>
02300	EARTHWORK
02315	EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS
02763	PAVEMENT MARKINGS
07412	NON STRUCTURAL STANDING SEAM METAL ROOF SYSTEM (NSSSMRS)
07535	MODIFIED BITUMEN ROOFING

CHANGES TO THE DRAWINGS.

- 3) Replacement Drawings.- Replace the drawings listed below with the attached new drawings(s) of the same number, bearing the notation "AM #0003":

c04_3.cal	Seq 4	C4	OVERALL LAYOUT PLAN - TRAINING SITE
c06_3.cal	Seq 6	C6	LAYOUT PLAN 2- TRAINING SITE
c07_3.cal	Seq 7	C7	OVERALL GRADING PLAN - TRAINING SITE
c09_3.cal	Seq 9	C9	GRADING PLAN 2- TRAINING SITE
c11_3.cal	Seq 11	C11	OVERALL UTILITY PLAN - TRAINING SITE
c12_3.cal	Seq 12	C12	UTILITY PLAN 1- TRAINING SITE
c16_3.cal	Seq 16	C16	SANITARY SEWER PROFILES- TRAINING SITE
c23_3.cal	Seq 23	C23	UTILITY DETAILS- TRAINING SITE
a108_3.cal	Seq 41	A1.08	ROOF PLAN
a127_3.cal	Seq 60	A1.27	WALL SECTIONS
a137_3.cal	Seq 70	A1.37	MISCELLANEOUS DETAILS
a138_3.cal	Seq 71	A1.38	MISCELLANEOUS DETAILS
a140_3.cal	Seq 73	A1.40	PARTIAL 1ST FLR FURNITURE PLAN
a141_3.cal	Seq 74	A1.41	PARTIAL 1ST FLR FURNITURE PLAN
a142_3.cal	Seq 75	A1.42	PARTIAL 1ST FLR FURNITURE PLAN

a144_3.cal	Seq 77	A1.44	PARTIAL 2ND FLR FURNITURE PLAN
a145_3.cal	Seq 78	A1.45	PARTIAL 2ND FLR FURNITURE PLAN
p104_3.cal	Seq 138	P1.04	PLUMBING FLOOR PLAN
e116_3.cal	Seq 167	E1.16	1ST FLOOR POWER PLAN AREA B - TRAINING CENTER
e117_3.cal	Seq 168	E1.17	2ND FLOOR POWER PLAN TRAINING CENTER
e118_3.cal	Seq 169	E1.18	KITCHEN POWER PLAN TRAINING CENTER
e129_3.cal	Seq 180	E1.29	PANEL SCHEDULES 2 TRAINING CENTER
a204_3.cal	Seq 184	A2.04	ROOF PLAN & DETAILS
a215_3.cal	Seq 195	A2.15	MISCELLANEOUS DETAILS
e205_3.cal	Seq 227	E2.05	POWER PLAN AREA B
e212_3.cal	Seq 234	E2.12	PANEL SCHEDULES
c305_3.cal	Seq 252	C3.05	LAYOUT PLAN- ECS SITE -BID OPTION #6
c311_3.cal	Seq 258	C3.11	UTILITY PLAN- ECS SITE - BID OPTION #6
c312_3.cal	Seq 259	C3.12	JOINT PLAN & DETAILS- ECS SITE- BID OPTION #6
c313_3.cal	Seq 260	C3.13	PAVING DETAILS- ECS SITE- BID OPTIONS #1, 4 & 6
c314_3.cal	Seq 261	C3.14	SANITARY SEWER PROFILES & DETAILS- ECS SITE-OPTION #6
a304_3.cal	Seq 274	A3.04	ROOF PLAN & DETAILS
a316_3.cal	Seq 286	A3.16	MISCELLANEOUS DETAILS
e301_3.cal	Seq 327	E3.01	ELECTRICAL NEW SITE PLAN ECS
e308_3.cal	Seq 334	E3.08	POWER PLAN AREA A ECS

END OF AMENDMENT

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

SECTION 04100

(MDS)

MORTAR AND MASONRY GROUT

PART 1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Mortar and grout for masonry. (Pre-bagged, prepared mortar mix is not acceptable.)

1.2 RELATED SECTIONS

1.2.1 Section 04320 - Veneer Masonry System: Installation of mortar.

1.2.2 NOT USED

1.2.3 Section 04340 - Reinforced Concrete Masonry Unit System: Installation of mortar and grout.

1.2.4 Section 08112 - Standard Steel Frames: Grouting steel door frames.

1.3 REFERENCES

1.3.1 ACI 530 - Building Code Requirements for Masonry Structures.

1.3.2 ACI 530.1 - Specifications For Masonry Structures.

1.3.3 Not Used.

1.3.4 ASTM C94 - Ready-Mixed Concrete.

1.3.5 ASTM C144 - Aggregate for Masonry Mortar.

1.3.6 ASTM C150 - Portland Cement.

1.3.7 ASTM C207 - Hydrated Lime for Masonry Purposes.

1.3.8 ASTM C270 - Mortar for Unit Masonry.

1.3.9 ASTM C404 - Aggregates for Masonry Grout.

1.3.10 ASTM C476 - Grout for Masonry.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.3.11 ASTM C780 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

1.3.12 ASTM C1019 - Method of Sampling and Testing Grout.

1.3.13 ASTM C1072 - Method for Measurement of Masonry Flexural Bond Strength.

1.3.14 ASTM E447 - Test Methods for Compressive Strength of Masonry Prisms.

1.3.15 ASTM E518 - Test Method for Flexural Bond Strength of Masonry.

1.3.16 Not Used.

1.4 SUBMITTALS:

1.4.1 Submit under provisions of Section 01330.

SD-01 Data

Design Mix; GA.

Indicate whether the Proportion or Property specification of ASTM C270 is to be used. Indicate required environmental conditions and admixture limitations.

SD-09 Reports

Reports, Mortar; GA.

Submit reports on mortar indicating conformance of mortar to property requirements of ASTM C270.

Reports, Grout; GA.

Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476 and test and evaluation reports to ASTM C1019.

SD-13 Certificates

Mortar and Masonry Grout; GA.

Manufacturer's certification that products meet or exceed specified requirements.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

SD-14 Samples

Mortar; GA.

Submit two samples of mortar, illustrating mortar color and color range. Color of mortar illustrated in field sample panels of related specification sections shall be included in the process of approving this submittal.

1.5 QUALITY ASSURANCE

1.5.1 Perform Work in accordance with ACI 530 and ACI 530.1.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Store aggregates where required characteristics can be maintained and contamination can be avoided.

1.7 ENVIRONMENTAL REQUIREMENTS

1.7.1 Maintain materials and surrounding air temperature to minimum 4.44 degrees C prior to, during, and 48 hours after completion of masonry work.

1.7.2 Maintain materials and surrounding air temperature to maximum 32.2 degrees C prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Portland Cement: ASTM C150, Type I, gray in color.

2.1.2 Mortar Aggregate: ASTM C144, standard masonry type.

2.1.3 Hydrated Lime: ASTM C207, Type S.

2.1.4 Grout Course Aggregate: ASTM C404.

2.1.5 NOT USED.

2.1.6 Water: Clean and potable.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.1.7 Bonding Agent: Latex.

2.2 NOT USED.

2.3 MORTAR MIXES

2.3.1 Mortar For Load Bearing Walls and Partitions: ASTM C270, Type S using the Property specification.

2.3.2 Mortar For Non-Load Bearing Walls and Partitions: ASTM C270, Type S using the Property specification.

2.3.3 Mortar For Masonry Installed Below Grade: ASTM C270, Type S using the Property specification.

2.3.4 Pointing Mortar: ASTM C270, Type N using the Property specification.

2.4 MORTAR MIXING

2.4.1 Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.

2.4.2 Maintain sand uniformly damp immediately before the mixing process.

2.4.3 NOT USED

2.4.4 Do not use anti-freeze compounds to lower the freezing point of mortar.

2.4.5 If water is lost by evaporation, re-temper only within two hours of mixing.

2.4.6 Use mortar within two hours after mixing at temperatures of 32.2 degrees C, or two-and-one-half hours at temperatures under 4.4 degrees C.

2.5 GROUT MIXES

2.5.1 Grout for bond beams, lintels, steel door frames, and other components as indicated. Grout shall be 25 Mpa strength at 28 days; 200 - 254mm slump; premixed type in accordance with ASTM C94.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.6 GROUT MIXING

2.6.1 Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 course grout.

2.6.2 Add admixtures in accordance with manufacturer's instructions; mix uniformly.

2.6.3 Do not use anti-freeze compounds to lower the freezing point of grout.

2.7 MIX TESTS

2.7.1 Testing of Mortar Mix: In accordance with ASTM C270.

2.7.2 Testing of Grout Mix: In accordance with ASTM C1019 for compressive strength and slump.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Request inspection of spaces to be grouted.

3.2 INSTALLATION

3.2.1 Install mortar and grout to requirements of the specific masonry sections.

3.2.2 Work grout into masonry cores and cavities to eliminate voids.

3.2.3 Do not install grout in lifts greater than 400mm or two CMU courses without consolidating grout by rodding.

3.2.4 Do not displace reinforcement while placing grout.

3.2.5 Remove excess mortar from grout spaces.

3.3 FIELD QUALITY CONTROL

3.3.1 Field inspection and testing will be performed.

3.3.2 Test and evaluate mortar in accordance with ASTM C780.

3.3.3 Test and evaluate grout in accordance with ASTM C1019.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.3.4 Test mortar and masonry units to ASTM C1072, E447, and E518; test in conjunction with masonry unit sections.

END OF SECTION

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

SECTION 04255

(MDS)

MASONRY VENEER/STEEL STUD WALLS

PART 1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Masonry veneer (brick) attached to steel stud backup walls located above the CMU walls in the Maintenance Bay 108 - Building B (OMS).

1.1.2 Masonry anchorage and accessories.

1.1.3 Moisture barrier.

1.2 RELATED SECTIONS

1.2.1 Section 04100 - Mortar and Masonry Grout.

1.2.2 Section 04320 - Veneer Masonry System: Brick.

1.2.3 Section 05120 - Structural Steel: Lintels.

1.2.4 Section 05400 - Cold Formed Metal Framing: Steel stud wall framing for veneer/steel stud walls.

1.2.5 Section 07620 - Sheet Metal Flashing and Trim: Flashings for masonry work.

1.2.6 Section 07710 - Manufactured Roof Specialties: Copings.

1.2.7 Section 07900 - Joint Sealers: Sealant at control joints.

1.2.8 Section 09260 - Gypsum Board Systems: Gypsum board sheathing in veneer/steel stud wall cavity.

1.3 REFERENCES

1.3.1 AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

1.3.1.1 AISC MO16 (1989; 9th Ed) Manual of Steel Construction

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.3.2 AMERICAN IRON AND STEEL INSTITUTE (AISI)

1.3.2.1 AISI SG-671 (1986; Addenda 1989; Errata Nov 30, 1990) Cold-Formed Steel Design Manual: Part I Design of Cold-Formed Steel Structural Members

1.3.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1.3.3.1 ASTM A 123 (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

1.3.3.2 ASTM A 153 (1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

1.3.3.3 ASTM A 446 (1989) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality

1.3.3.4 ASTM A 82 Cold Drawn Steel Wire for Concrete Reinforcement

1.3.3.5 ASTM C 954 (1986) Steel Drill Screws for the Application of Gypsum Board or Metal Plaster. Attachment to Steel Studs from 0.033 inches to 0.112 inches in thickness

1.3.3.6 ASTM C 955 (1988) Load-Bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases

1.3.3.7 ASTM C 1002 (1988) Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases

1.3.3.8 ASTM A 36 Structural Steel

1.3.3.9 Not Used

1.3.3.10 ASTM D 1330 (1985; R 1990) Rubber Sheet Gaskets

1.3.3.11 Not Used

1.3.4 AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR- CONDITIONING (ASHRAE)

1.3.4.1 Not Used

1.3.5 AMERICAN WELDING SOCIETY (AWS)

1.3.5.1 AWS D1.3(1989) Structural Welding Code - Sheet Steel

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.3.6 DEPARTMENT OF COMMERCE (DOC)

1.3.6.1 Not Used

1.4 SUBMITTALS:

1.4.1 Submit under provisions of Section 01330:

SD-01 Data

Steel Frame Design Data; GA.

Calculations demonstrating the structural performance of the cold-formed steel framing system for the specified loadings and deflection criteria in accordance with the provisions of AISI SG-671.

Lintels Design Data; GA.

Calculations demonstrating the structural adequacy of steel lintels for the calculated gravity loadings being supported. This analysis shall be in accordance with AISC MO16.

Veneer Anchors Design Data; GA.

Test results demonstrating that the veneer anchors are structurally adequate to resist the specified loadings and are approved for use with rigid insulation shall be submitted for approval.

Moisture Barrier; FIO.

Manufacturer's descriptive data and installation instructions for the moisture barrier.

SD-04 Drawings

Framing, Connections, and Fasteners; GA.

Details of cold-formed steel framing and support around openings, including framing connections, steel lintels, steel shelf angles, attachment to other building elements and bridging. Drawings shall indicate thickness, material, dimensions, protective coatings, and section properties of all steel studs and other cold-formed steel framing members and of all steel lintels used in exterior wall framing. Drawings shall also indicate size and type of all fasteners including size and type of all welds.

SD-14 Samples

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

Longitudinal Joint Reinforcement; FIO.

Veneer Anchors; FIO.

Sample Masonry Panel; GA.

1.5 SAMPLE MASONRY PANEL

1.5.1 After material samples are approved and prior to starting masonry work, sample masonry panels shall be constructed for each type and color of masonry required. At least 48 hours prior to constructing the sample panel or panels, the Contractor shall submit written notification to the Contracting Officer's Representative. Sample panels shall not be built in, or as part of the structure, but shall be located where directed by the Contracting Officer. This panel can be constructed on top of the sample panel required under Section 04320 if adequately braced and approved by the Contracting Officer.

1.5.2 Configuration: Panels shall be L-shaped or otherwise configured to represent all of the wall elements. Panels shall be of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project. One leg shall be 2400mm the other leg shall be 1800mm.

1.5.3 Composition: Panels shall show full color range, texture, and bond pattern of all types of masonry work. The Contractor's method for mortar joint tooling; constructing lintels; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work shall be demonstrated during the construction of the panels. Installation or application procedures for anchors, wall ties, control joints, insulation, moisture barrier, gypsum sheathing, flashing, and weep holes shall be shown in the sample panels. Panels that represent reinforced masonry shall contain a 600 by 600mm opening placed at least 600mm above the panel base and 600mm away from all free edges, corners, and control joints. Required reinforcing shall be provided around this opening as well as at wall corners and control joints.

1.5.4 Construction Method: Temporary provisions shall be demonstrated to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. The Contractor shall demonstrate and receive approval on the method that will be used to bring up the masonry wythes. Panels shall be built on a properly designed concrete foundation.

1.5.5 Usage: The completed panels shall be used as the standard of workmanship for the type of masonry represented. Masonry work shall not commence until the sample panel for that type of masonry construction has been completed and approved. Panels shall be protected from the weather and construction operations until the masonry work has been completed and approved. After completion of the work, the sample panels, including all foundation concrete, shall become the property of the Contractor and shall be removed from the construction site.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.6 DELIVERY, HANDLING AND STORAGE

1.6.1 Materials shall be delivered to the site in a undamaged condition and stored out of contact with the ground in a manner to avoid chipping and breakage and in accordance with the manufacturer's instructions.

PART 2 PRODUCTS

2.1 MASONRY VENEER

2.1.1 See Section 04320 for masonry veneer requirements.

2.2 MORTAR

2.2.1 Refer to Section 04100 for mortar requirements.

2.3 JOINT REINFORCEMENT

2.3.1 See Section 04340 - Concrete Masonry Units

2.3.2 Joint reinforcement shall be of steel wire conforming to ASTM A 82. Fabrication shall be by welding. Tack welding will not be permitted. Reinforcement shall be zinc coated after fabrication in accordance with ASTM A 153, Class B-2. Joint reinforcement shall consist of at least 1 continuous longitudinal wire in the veneer wythe.

2.4 COLD-FORMED STEEL FRAMING

2.4.1 Refer to Section 05400 - Cold- Formed Steel Framing.

2.4.2 NOT USED.

2.4.3 Runners, Tracks, Bridging and Accessories: All cold-formed steel sheet framing members, components, and accessories, other than the steel studs, shall conform to ASTM C 955 and be of steel conforming to ASTM A 446, Grade A, having a minimum yield strength of 33,000 psi.

2.5 INSULATION

2.5.1 Refer to Section 07212 for board insulation.

2.6 GYPSUM SHEATHING

2.6.1 Fire and water resistant gypsum sheathing that is installed on the cold-formed steel framing

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

system in the cavity shall be as specified in Section 09260 - Gypsum Board System. Gypsum sheathing shall be 13mm thick.

2.7 VENEER ANCHORS

2.7.1 Anchor assemblies for the attachment of the masonry veneer to the cold-formed steel framing, structural steel will be designed for the design loadings shown. Anchors will transfer the design loadings from the masonry veneer to the cold-formed steel framing system or other support without exceeding the allowable stresses and deflections in the anchors. Anchors and fastening system shall not transfer any loads to the rigid insulation and shall be approved for use with rigid insulation. Length of anchor wires shall be such that the outermost wires lie between 32mm from each face of the masonry veneer. Anchors wires shall not have drips. Wires for veneer anchors shall be rectangular or triangular hoops formed from 4.8mm diameter steel wire conforming to ASTM A 82. Anchor assemblies including wires and anchor plates shall be hot-dip galvanized conforming to ASTM A 153, Class B-2. The veneer anchor shall have a minimum capacity of 890N. The load-displacement capacity of each veneer anchor, both in direct pullout for tension and compression, shall not be less than 13.8MPa or a deflection of 1.27mm per 445N of load in tension or compression. In the direction perpendicular to the masonry veneer, the anchor assembly shall have a maximum play of 1.6mm.

2.7.1.1 Adjustable Pintle-Eye Type Wire Anchors shall be two pieces rectangular type double pintle anchors.

2.8 CONNECTIONS

2.8.1 Screws, bolts and anchors shall be hot-dip galvanized in accordance with ASTM A 123 or ASTM A 153 as appropriate.

2.8.1.1 Framing Screws, Bolts and Anchors: Screws, bolts and anchors used in the assembly of the cold- formed steel framing system shall be as required by design of the framing system for the specified loading. Screw, bolt and anchor sizes shall be shown on the shop drawings.

2.8.2 Welding: All welded connections shall be designed and all welding shall be performed in accordance with AWS D1.3, as modified by AISI SG-671. All welders shall be qualified in accordance with AWS D1.3. All welds shall be cleaned and touched-up with zinc rich paint.

2.8.3 Veneer Anchor Screws: Screws for attachment of the veneer anchors to the cold- formed steel framing members shall be as required by design to provide the needed pullout load capacity but not less than No. 12. Screws shall be shown on the shop drawings. The length of screws shall be such that the screws penetrate the holding member by not less than 15.9mm.

2.8.4 Gypsum Sheathing Screws (See Section 09260):

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

Screws for attachment of gypsum sheathing to cold-formed steel framing shall conform to ASTM C 1002, Type S or ASTM C 954.

2.9 SYNTHETIC RUBBER WASHERS

2.9.1 Synthetic rubber washers for placement between veneer anchors and the outside face of the gypsum sheathing in the cavity shall conform to ASTM D 1330, Grade I.

2.10 FLASHING

2.10.1 Copper or stainless steel flashing shall conform to the requirements in Section 07620 Sheet Metal flashing and Trim. Flashing shall be supplied in a continuous sheet extending from the gypsum sheathing through the insulation, cavity and into the masonry veneer as shown.

2.11 STEEL LINTELS

2.11.1 Steel shapes used for lintels shall conform to ASTM A 36. Lintels shall be provided as shown. These steel members shall be hot-dip galvanized in accordance with ASTM A 123. See Section 05120 Structural Steel.

2.12 CAULKING AND SEALANTS

2.12.1 Caulking and sealants shall be as specified in Section 07920 - Joint Sealers.

2.13 WEEPS

2.13.1 Weeps are specified in Section 04320 Veneer Masonry System.

2.14 MOISTURE BARRIER

2.14.1 The moisture barrier shall be a water-resistant membrane of 15# roofing felt or similar approved material such as Tyvek Building Wrap by Dupont or Barricade Building Wrap by Simplex.

2.15 NOT USED

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

3.1.1 Wall sections, types of construction, and dimensions shall be as shown. Metal door and window frames and other special framing shall be built and anchored into the wall system as indicated.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.2 STEEL STUD WALL FRAMING

3.2.1 The top track of the stud wall system shall be slip jointed to accommodate vertical deflections of the supporting members as shown on the drawings. Top and bottom tracks shall be securely anchored to resist track rotation by alternating fastener locations to provide two rows, one row near each track flange as shown on the drawings. Both flanges of all steel studs shall be securely fastened with screws to the flanges of the top and bottom tracks as shown on the drawings. All details for affixing steel studs to runners and all other sheet steel framing members along with all details necessary for anchorage of the steel stud wall system to the building structural systems shall be shown on the drawings. Horizontal bridging shall be provided as necessary. Studs shall be spaced 400mm on centers. Coordinate stud spacing with sheathing and anchor requirements. At wall openings for doors, windows and other similar features, the framing system shall provide for the installation and anchorage of the required sub-frames or finish frames. Steel frames shall be securely attached through built-in anchors to the nearest stud on each side of the opening with self- drilling screws. Double studs shall be provided at both jambs of all door openings. Door frames and other built-in items shall be grouted solid.

3.3 GYPSUM SHEATHING

3.3.1 Sheathing shall be installed on the exterior face of the cold-formed steel framing system in the cavity with self-drilling screws. Screws shall be located a minimum of 10mm from the ends and edges of sheathing panels and shall be spaced not more than 200mm on each supporting member except at vertical slip joints, the sheathing should be connected to the vertical studs only so as not to prevent movement of the slip joint. Edges and ends of gypsum sheathing panels shall be butted snugly with vertical joints staggered. The vertical edges of sheathing shall not occur at column locations except at building corners. All joints, holes, and gaps resulting from abandoned screw installations, from damage to panels, and from cutting and fitting of panels at junctures with doors, windows, foundation walls, floor slabs and other similar locations shall be taped or filled with exterior rubber-base caulk.

3.4 VENEER ANCHORS

3.4.1 Veneer anchors shall be attached with screws through the sheathing to the steel studs or other support members as indicated. Veneer anchors shall be installed with the outermost wires lying between 15.9mm from each face of the masonry veneer. Synthetic rubber washers shall be used between the anchor connector plates and the moisture barrier. A clutch torque slip screw gun shall be used on screws attaching veneer anchors to cold-formed steel members. Veneer anchors with corrugated sheet metal or wire mesh members extending across the wall cavity shall not be used. There shall be one veneer anchor attached to steel studs and other supports with a maximum spacing of 400mm vertically and horizontally on center. For pintle-eye anchors the vertical distance between the pintle section horizontal wires and the eye section horizontal wires shall not exceed 13mm

3.5 BOARD INSULATION

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.5.1 See Section 07212.

3.5.2 Insulation shall be glued to the gypsum sheathing. Insulation shall have staggered edges that are snugly fitted together to provide a solid substrate for the moisture barrier. The vertical edges of insulation shall not occur at steel column locations except at building corners. The edges of the foil facing on the insulation shall be taped.

3.6 MOISTURE BARRIER

3.6.1 Moisture Barrier: The moisture barrier shall be installed on the outer face of the rigid insulation in the cavity of the wall. The moisture barrier shall be installed horizontally and shingled with each sheet lapped not less than 150mm over the sheet below. Vertical end joints shall be lapped not less than 150mm and shall be staggered. Moisture barrier shall be continuous over column locations. Attachment of the moisture barrier shall be with staples spaced not greater than 400mm on center or as required by the manufacturer of the moisture barrier. The moisture barrier shall not be a vapor retarder that might trap water in the stud space of the wall.

3.7 MASONRY VENEER

3.7.1 Exterior masonry veneer wythes shall be constructed to the thickness indicated on the drawings. A cavity consisting of a 19mm minimum width air space as shown on the drawings shall be provided between the moisture barrier and the masonry veneer.

3.7.2 Masonry veneer will not be installed until the gypsum sheathing, insulation, moisture barrier, veneer anchors and flashing have been installed on the cold-formed steel framing system. Extreme care shall be taken to avoid damage to the moisture barrier and flashing during construction of the masonry veneer. Any portion of the moisture barrier and flashing that is damaged shall be repaired or replaced prior to completion of the veneer. Masonry shall be placed in running bond pattern. Longitudinal reinforcement consisting of at least one continuous galvanized steel wire shall be placed in the veneer wythe. The minimum wire size shall be 9 gage. Vertical joints on alternating courses shall be aligned and kept vertically plumb. Solid masonry units shall be laid in a non-furrowed full bed of mortar, beveled and sloped toward the center of the wythe on which the mortar is placed. Units shall be shoved into place so that the vertical mortar joints are completely full and tight. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned and re-laid. Mortar that protrudes more than 13mm into the cavity space shall be removed. Means shall be provided to ensure that the cavity space is kept clean of mortar droppings and other loose debris. Chases and raked-out joints shall be kept free from mortar and debris. Faces of units used in finished exposed areas shall be free from chipped edges, material texture or color defects or other imperfections distracting from the appearance of the finished work.

3.7.3 Surface Preparation: Surfaces on which masonry is to be laid shall be cleaned of laitance or other foreign material. No units having a film of water shall be laid.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.7.4 Hot Weather Construction: Temperatures of masonry units and mortar shall not be greater than 48.9 degrees C when laid. Masonry erected when the ambient air temperature is more than 37.2 degrees C in the shade and when the relative humidity is less than 50 percent shall be given protection from the direct exposure to wind and sun for 48 hours after the installation.

3.7.5 Cold Weather Construction: Temperatures of masonry units and mortar shall not be less than 4.4 degrees C when laid. When the ambient air temperature is 0 degrees C or less, masonry veneer under construction shall be protected and maintained at a temperature greater than 0 degrees C for a period of 48 hours after installation. The proposed method of maintaining the temperature within the specified range shall be submitted for approval prior to implementation. No units shall be laid on a surface having a film of frost or water.

3.7.6 Tolerances: Masonry shall be laid plumb, level and true to line within the tolerances specified in TABLE 1. All masonry corners shall be square unless otherwise indicated on the drawings.

TABLE 1

Variation From Plumb:

In adjacent units - 3.2mm
In 3000mm - 6.4mm
In 6000mm - 9.5mm
In 12000mm or more - 12.7mm

Variation From Level Or Grades:

In 3000mm - 3.2mm
In 6000mm - 6.4mm
In 12000mm or more - 12.7mm

Variation From Linear Building Lines:

In 6000mm - 12.7mm
In 12000mm or more - 19mm

Variation From Cross Sectional Dimensions Of Walls:

Plus 13mm to minus 6.4mm

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.7.7 Joint Reinforcement:

Unless otherwise shown, joint reinforcement shall be spaced at 200mm on center vertically. Joint reinforcement shall be placed in the same masonry course as veneer anchors. The anchors shall be designed to accommodate the wire. Joint reinforcement shall be placed so that longitudinal wires are centered in the veneer wythe for solid units. Longitudinal wires shall be fully embedded in mortar for their entire length. Splices in joint reinforcement shall be lapped a minimum of 150mm. Joint reinforcement must be discontinuous at all veneer joints. The minimum cover for joint reinforcement is 15.9mm.

3.7.8 Veneer Joints: Veneer control joints shall be provided at the locations shown on the drawings. Details of joints shall be as indicated on the drawings. Joints shall be clean and free of mortar and shall contain only backer rod and sealant, installed in accordance with Section 07900 - Joint Sealers. Horizontal reinforcement shall not extend through the joints.

3.7.9 Weep Holes: Weep holes which shall be formed with weep hole ventilators shall be provided 800mm maximum spacing on center, located over foundations, through-wall flashing, and any other horizontal interruptions of the cavity at the top and bottom of the exterior masonry wall. Head joint weep hole ventilators shall be provided near the top of the veneer wythe at the same spacing. Ventilators shall be placed between masonry units in the vertical mortar joint.

3.7.10 Flashing: Flashing shall be surface attached to the face of the gypsum sheathing. The flashing shall be turned up on the sheathing at a minimum of 254mm over flashed locations. The top edge of the flashing shall be sealed with exterior rubber base caulk as approved by the flashing manufacturer. The moisture barrier shall be lapped over the flashing at a minimum of 150mm.

3.7.11 Discontinuous Work: When necessary to temporarily discontinue the work, masonry shall be stepped back for joining when work resumes. Toothing may be used only when specifically approved. Before resuming work, loose mortar shall be removed and the exposed joint shall be thoroughly cleaned. Top of walls subjected to rain or snow shall be covered with non-staining waterproof covering or membrane when work is not in process. Covering shall extend a minimum of 600mm down on each side of the wall and shall be held securely in place.

3.7.12 Cleaning: Mortar daubs or splashings shall be completely removed from finished exposed masonry surfaces before they harden or set up. Before completion of the work, all defects in mortar joints shall be raked out as necessary, filled with mortar, and tooled to match the adjacent existing mortar in the joints. The proposed cleaning method shall be done on the sample wall panel and the sample panel shall be examined for discoloration or stain. If the sample panel is discolored or stained, the method of cleaning shall be changed to ensure that the masonry surfaces in the structure will not be adversely affected. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Cleaning shall be accomplished with the use of stiff bristle fiber

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

brushes, wooden paddles, wooden scrapers, or other suitable nonmetallic tools. The exposed masonry surfaces shall be saturated with water and cleaned with a proprietary masonry cleaning agent recommended by the masonry products' manufacturer. The cleaning agent shall not adversely affect the masonry surfaces. Proprietary cleaning agents shall be used in conformance with the cleaning product manufacturer's printed recommendations. Efflorescence or other stains shall be removed in conformance with the recommendations of the masonry unit manufacturer. After construction and cleaning, masonry surfaces shall be left clean, free of mortar daubs, stain, and discolorations, including scum from cleaning operations, and shall have tight mortar joints throughout. Metallic tools and brushes shall not be used for cleaning.

END OF SECTION

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

SECTION 04320

VENEER MASONRY SYSTEM

Part 1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Facebrick units.

1.1.2 Reinforcement, anchorage, and accessories.

1.1.3 Weeps

1.2 RELATED SECTIONS

1.2.1 Section 03300 - Cast-in-Place Concrete: Structural wall backing.

1.2.2 Section 04100 - Mortar and Masonry Grout: Mortar and grout.

1.2.3 Section 04340 Reinforced Concrete Masonry Unit System: Structural wall backup.

1.2.4 Section 05120 - Structural Steel: Placement of steel anchors for brick veneer reinforcement, including loose steel lintels, fabricated steel items, and steel angles.

1.2.5 Section 05400 - Cold Formed Metal Framing: Structural wall backing.

1.2.6 Section 07212 - Board Insulation: Cavity wall rigid insulation.

1.2.7 Section 07620 - Sheet Metal Flashing and Trim: Cap flashings over masonry work and placement of reglets for flashings.

1.2.8 Section 07900 - Joint Sealers: Rod and sealant at control and expansion joints.

1.2.9 Section 08520 - Aluminum Windows: Placement of window anchors in brick veneer.

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.3 REFERENCES

- 1.3.1 ACI 530 - Building Code Requirements for Masonry Structures.
- 1.3.2 ACI 530.1 - Specifications For Masonry Structures.
- 1.3.3 ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- 1.3.4 ASTM A123 - Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
- 1.3.5 ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate.
- 1.3.6 ASTM A525 - Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.
- 1.3.7 ASTM A641 - Zinc-Coated (Galvanized) Carbon Steel Wire.
- 1.3.8 ASTM B370 - Copper Sheet and Strip for Building Construction.
- 1.3.9 ASTM C55 - Concrete Building Brick.
- 1.3.10 ASTM C90 - Load-Bearing Concrete Masonry Units.
- 1.3.11 ASTM C216 - Facing Brick (Solid Masonry Units Made From Clay or Shale).
- 1.3.12 IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
- 1.3.13 UL - Fire Resistance Directory.

1.4 SUBMITTALS:

- 1.4.1 Submit under provisions of Section 01330

SD-01 Data:

Brick; FIO.

Fabricated Wire Reinforcement; FIO.

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

Provide data for veneer masonry units and fabricated wire reinforcement.

SD-13 Certificates:

Brick; FIO.

Fabricated Wire Reinforcement; FIO.

Certify that Products meet or exceed specified requirements.

SD-14 Samples:

Brick; GA.

Fabricated Wire Reinforcement; GA.

Weeps; GA.

Submit four samples of face brick, units to illustrate color, texture and extremes of color range.

1.5 QUALITY ASSURANCE

1.5.1 Perform Work in accordance with ACI 530 and ACI 530.1.

1.5.2 Maintain one copy copies of each document on site.

1.6 QUALIFICATIONS

1.6.1 Manufacturer:

Company specializing in manufacturing the Products specified in this section with minimum four years documented experience.

1.7 REGULATORY REQUIREMENTS

1.7.1 Conform to applicable UL Design Assemblies, as indicated for fire rated masonry construction.

1.8 MOCKUP

***03 1.8.1 Construct a masonry wall into an panel with a 90 degree corner. One leg shall be**

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2400mm the other leg shall be 1800mm. The panel shall be 1800mm high and shall include mortar joints and accessories, joint reinforcement and anchors, structural backup with dampproofing, wall openings, flashings, wall insulation, and typical foundation condition with corbeled brick, positioning and lapping of reinforcement steel and grouting of vertical cores. Panel shall include a properly reinforced 600 x 600mm opening placed 2'-0" above the base of the wall.

***03**

1.8.2 Locate where directed.

1.8.3 Mockup may not remain as part of the Work.

1.9 PRE-INSTALLATION CONFERENCE

1.9.1 Convene one week prior to commencing work of this Section.

1.10 DELIVERY, STORAGE, AND HANDLING

1.10.1 Materials shall be delivered to the site in a undamaged condition and stored out of contact with the ground in a manner to avoid chipping and breakage.

1.11 ENVIRONMENTAL REQUIREMENTS

1.11.1 Maintain materials and surrounding air temperature to minimum 4.44 degrees C prior to, during, and 48 hours after completion of masonry work.

1.11.2 Maintain materials and surrounding air temperature to maximum 32.22 degrees C prior to, during, and 48 hours after completion of masonry work.

1.12 COORDINATION

1.12.1 Coordinate the masonry work with brick veneer, and installation of window anchors and door anchors.

PART 2 PRODUCTS

2.1 NOT USED

2.2 BRICK UNITS

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.2.1 Face Brick:

ASTM C216, Type FBX, Grade SW; color as indicated. Units shall be solid brick to accomodate corbeling and other brick detailing.

2.2.2 NOT USED

2.2.3 Size and Shape:

Nominal modular size of 92 x 57.2 x 193.7mm. Provide special units for 90 degree corners, and lintels. All corbeled brick shall be solid units.

2.3 REINFORCEMENT AND ANCHORAGE

2.3.1 NOT USED

2.3.2 See Section 04340 - Reinforced Concrete Masonry Unit System for reinforcement and anchorage requirements of seismic and non-seismic conditions.

2.4 MORTAR AND GROUT

2.4.1 Mortar and Grout:

As specified in Section 04100.

2.5 FLASHINGS

2.5.1 Flashing:

As specified in Section 04340 and 04320.

2.6 ACCESSORIES

2.6.1 Preformed Control Joints: Closed cell neoprene sponge material. Provide with corner and tee accessories, heat fused joints.

2.6.1.1 Manufacturers:

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

Dur-O-Wall

Hohmann & Barnard, Inc.

2.6.2 Joint Filler: Closed cell polyethylene; oversized 50 percent to joint width; self-expanding; 19mm wide by maximum lengths.

2.6.3 Filter Fabric:

PEC-MAT as manufactured by Greenstreak, Inc., 3400 Tree Court Ind. Blvd., St. Louis, MO
MIRMAT - Series 2400 as manufactured by Mirafi, Inc., Charlotte, N.C.

2.6.4 Weeps: Shall consist of weep hole ventilators and be prefabricated aluminum grill type vents designed to prevent insect entry with maximum free area. Ventilator shall be sized to match the standard 10mm mortar joints and have a medium gray factory finish.

2.6.4.1 Manufacturers:

Dur-O-Wal

Hohmann & Barnard, Inc.

Heckman Building Products, Inc.

2.6.5 Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Verify that field conditions are acceptable and are ready to receive work.

3.1.2 Verify items provided by other sections of work are properly sized and located.

3.2 PREPARATION

3.2.1 Direct and coordinate placement of metal anchors supplied to other sections.

3.2.2 Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.3 COURSING

3.3.1 Establish lines, levels, and coursing indicated. Protect from displacement.

3.3.2 Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

3.3.3 Brick Units: Lay masonry with running bond unless indicated otherwise.

3.3.4 Coursing: Three units and three mortar joints to equal 200mm.

3.3.5 Mortar Joints: Concave.

3.4 PLACING AND BONDING

***03 3.4.1 Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work. Brick shall be laid with the better face exposed. The vertical head joints shall align and provide a neat uniform appearance. *03**

3.4.2 Lay hollow masonry units with face shell bedding on head and bed joints.

3.4.3 Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

3.4.4 Remove excess mortar as Work progresses.

3.4.5 Interlock intersections and external corners.

3.4.6 Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

3.4.7 Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.4.8 Isolate top joint of masonry walls from horizontal structural framing members and slabs or decks with compressible joint filler.

3.5 WEEPS

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.5.1 Install weeps in veneer at 800mm oc horizontally and align above through-wall flashing, above shelf angles and lintels. Center weeps over and under windows and over doors. Also install align weeps at bottom and top of walls in the vertical mortar joint to provide general air circulation in the masonry wall cavity.

3.6 CAVITY BEHIND VENEER

3.6.1 Do not permit mortar to drop or accumulate into cavity air space or to plug weeps.

3.6.2 Build outer wythe to permit installation of cavity insulation.

3.7 REINFORCEMENT AND ANCHORAGE

***03 3.7.1 Install horizontal joint reinforcement 400 mm oc. See Section 04340. *03**

3.7.2 Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 400 mm each side of opening.

3.7.3 Place joint reinforcement continuous in first and second joint below top of walls.

3.7.4 Lap joint reinforcement ends minimum 150mm.

***03 3.7.5 Embed adjustable type u shaped wall ties in loops of joint reinforcement anchoring veneer at maximum 400 mm oc vertically and 400 mm oc horizontally. Place at maximum 75 mm oc each way around perimeter of openings, within 300 mm of openings. Wall ties shall be 4.8mm diameter zinc coated steel wire double pintle to eye type and shall allow a maximum of 13mm eccentricity between each element of the tie. Play between the pintle and eye opening shall be no more than 1.6mm. *03**

3.8 MASONRY FLASHINGS

3.8.1 Extend flashings horizontally at foundation walls, above ledge or shelf angles and lintels, under parapet caps, at bottom of walls. Flashing shall terminate within mortar joints 9.5mm from the outside face of the brick.

3.8.2 Turn flashing up minimum 200 mm and bed into mortar joint of masonry seal at concrete back-up mortar joint.

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.8.3 Lap end joints minimum 150 mm and seal watertight.

3.8.4 Turn flashing, fold, and seal at corners, bends, and interruptions.

3.9 LINTELS

3.9.1 Install loose steel lintels over openings.

3.9.2 Maintain minimum 200 mm bearing on each side of opening.

3.10 CONTROL JOINTS

3.10.1 Do not continue horizontal joint reinforcement through control joints.

3.10.2 Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.10.3 Coordinate sealant in Section 07900 with appropriate control joint size.

3.11 TOLERANCES

3.11.1 Maximum Variation From Unit to Adjacent Unit:

1.5 mm.

3.11.2 Maximum Variation from Plane of Wall:

6 mm/3 m and 13 mm/6 m or more.

3.11.3 Maximum Variation from Plumb:

6 mm per story non-cumulative; 13 mm in two stories or more.

3.11.4 Maximum Variation from Level Coursing:

3 mm/m and 6 mm/3 m; 13 mm/9 m.

3.11.5 Maximum Variation of Joint Thickness:

*****SAFETY PAYS*****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3 mm/m.

3.12 CUTTING AND FITTING

3.12.1 Cut and fit for conduit, sleeves, and recessed items. Coordinate with other sections of work to provide correct size, shape, and location.

3.12.2 Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12.3 Cut brick where indicated to form space for the reglet.

3.13 CLEANING

3.13.1 Remove excess mortar and mortar smears.

3.13.2 Replace defective mortar. Match adjacent work.

3.13.3 Clean soiled surfaces with cleaning solution.

3.13.4 Use non-metallic tools in cleaning operations.

3.14 PROTECTION OF FINISHED WORK

3.14.1 Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

***03 3.14.2 Cover top of walls with nonstaining waterproof covering or membrane when work is not in progress. The covering is to extend down the sides of the wall at least 600mm and be securely anchored in place. Walls must be protected with the covering until the top of walls are sealed with a parapet system or roof.**

***03**

END OF SECTION

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

SECTION 04340

(MDS)

REINFORCED CONCRETE MASONRY UNIT SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Concrete masonry units including hollow core, solid, concrete brick and pre-faced block.

1.1.2 Flashing.

1.1.3 Joint reinforcement, anchorage, and accessories.

1.2 RELATED SECTIONS

1.2.1 Section 04100 - Mortar and Masonry Grout: Mortar and grout.

1.2.2 Section 07160 - Bituminous Dampproofing: Dampproofing on masonry surfaces.

1.2.3 Section 04320 - Veneer Masonry System: Brick veneer.

1.2.4 Section 07212 - Board Insulation: Cavity wall rigid insulation.

1.2.5 Section 07900 - Joint Sealers: Rod and sealant at control joints.

1.3 REFERENCES

1.3.1 ACI 530 - Building Code Requirements for Masonry Structures.

1.3.2 ACI 530.1 - Specifications For Masonry Structures.

1.3.3 Not Used.

1.3.4 Not Used.

1.3.5 ASTM A82 Cold-Drawn Steel wire for Concrete Reinforcement.

1.3.6 ASTM A615-86 Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.3.7 ASTM A641 - ZinCoated (Galvanized) Carbon Steel Wire.

1.3.8 ASTM B370 - Copper Sheet and Strip for Building Construction.

1.3.9 ASTM C55 - Concrete Building Brick.

1.3.10 ASTM C90 - Load-Bearing Concrete Masonry Units.

1.3.11 Not Used.

1.3.12 Not Used.

1.3.13 ASTM C744 - Glazed Concrete and Calcium Silicate Masonry Units.

1.3.14 NOT USED

1.3.15 IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

1.3.16 UL - Fire Resistance Directory.

1.4 SUBMITTALS:

1.4.1 Submit under provisions of Section 01330:

SD-01 Data

Concrete Brick FIO

Glazed Block; FIO.

Hollow Block Units; FIO.

Fabricated Wire Reinforcement; FIO.

Provide data for each type of masonry unit and fabricated wire reinforcement.

SD-04 Drawings

Reinforced Unit Masonry System FIO

SD-13 Certificates

Concrete Brick; FIO

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

Glazed Block; FIO.

Hollow Block Units; FIO.

Fabricated Wire Reinforcement; FIO.

Manufacturer's certification that masonry products meet or exceed specified requirements.

SD-14 Samples

Glazed Block; FIO.

Hollow Block Units; FIO.

Submit four samples of each masonry unit type to illustrate color, texture and extremes of color range.

1.5 QUALITY ASSURANCE

1.5.1 Perform Work in accordance with ACI 530 and ACI 530.1.

1.5.2 Maintain one copy of each document on site.

1.6 QUALIFICATIONS

1.6.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum four years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

1.7.1 Deliver masonry materials to project in undamaged condition.

1.7.2 Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

1.7.3 Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.7.4 Accept hollow core, concrete brick and glazed masonry units on site. Inspect for damage.

1.8 ENVIRONMENTAL REQUIREMENTS

1.8.1 Maintain materials and surrounding air temperature to minimum 4.44 degrees C prior to, during, and 48 hours after completion of masonry work.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.8.2 Maintain materials and surrounding air temperature to maximum 32.22 degrees C prior to, during, and 48 hours after completion of masonry work.

1.8.3 Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.9 NOT USED.

1.10 PRE-INSTALLATION CONFERENCE

1.10.1 Convene one week prior to commencing work of this section

1.11 COORDINATION

1.11.1 Coordinate the masonry work with installation of window and door anchors.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

2.1.1 Hollow Block Units (CMU): ASTM C90, Type I - Moisture Controlled normal weight.

2.1.2 NOT USED

2.1.3 NOT USED

2.1.4 Glazed Block Units: ASTM C744 with resinous surfacing on ASTM C90 masonry units, Type I - Moisture Controlled; normal weight; 200mm x 200mm scored; color as indicated on the drawings.

2.1.5 Size and Shape: Nominal modular sizes of 100x200x400mm, 200x200x400mm, and 300x200x400mm. Provide special units for 90 degree corners, bond beams, pilasters, and lintels. The outside corners of all exposed CMU interior walls including glazed block shall have a bullnose edge.

2.2 REINFORCEMENT AND ANCHORAGE

2.2.1 Not Used

2.2.2 Rigid Partition Anchors: Bent steel shape, 50mm x 8mm thick hot dip galvanized to ASTM A123 B2 finish.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.2.2.1 Manufacturers:

- a. Betco Block: Betco Block VA Robert Carmody, 1-800-486-4011
- b. Clarkes Block GA L.E.Wells, 912-234-3436
- c. Dagostino Building Blocks NY Ed Carey, 518-374-3116

***03 2.2.3 Horizontal Joint Reinforcement: Joint reinforcement ladder type, steel wire conforming to ASTM A82, hot- dipped galvanized to ASTM A153 Class B2 after fabrication. Reinforcement shall consist of two or more parallel longitudinal wires not lighter than 9 gauge with cross wires not lighter than 14 gauge. Welded to the ladder a double loop to hold the pintle which extends into the veneer to create a composite wall construction.**
***03**

2.2.3.1 Manufacturers:

- a. Heckman Building Products, Inc.
- b. Dur-O-Wal, Inc.
- c. Hohman & Barnard, Inc.

2.3 MORTAR AND GROUT

2.3.1 Mortar and Grout: As specified in Section 04100.

2.4 FLASHINGS

2.4.1 Copper: ASTM B370, cold rolled; 7.59g/sq m, .685mm thick; natural finish.

2.4.2 Lap Sealant: Butyl sealant, G, shall conform to ASTM C 1085.

2.5 ACCESSORIES

2.5.1 Preformed Control Joints: Rubber material. Provide with corner and tee accessories, heat fused joints.

2.5.1.1 Manufacturers:

- a. Heckman Building Products, Inc.
- b. Dur-O-Wall
- c. Hohmann & Barnard, Inc.

2.5.2 Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self-expanding;

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002
lengths per the manufacturer.

2.5.2.1 Manufacturers:

- a. Heckman Building Products, Inc.
- b. Dur-O-Wal
- c. Hohmann & Barnard, Inc.

2.5.3 Building Paper: No. 15 asphalt saturated felt.

2.5.4 Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.

2.5.5 Weeps: See 04320 Veneer Masonry System.

2.5.6 Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials; per block manufacturer's recommendations.

***03 2.5.7 Bar Positioners: Used to prevent displacement of reinforcement during the course of construction. Positioners shall be factory fabricated from 9 gauge steel wire with a hot dipped galvanized finish.**

***03**

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Verify that field conditions are acceptable and are ready to receive work.

3.1.2 Verify items provided by other sections of work are properly sized and located.

3.1.3 Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

3.2.1 Direct and coordinate placement of metal anchors supplied to other Sections.

3.2.2 Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.3.1 Establish lines, levels, and coursing indicated. Protect from displacement.

3.3.2 Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

3.3.3 Masonry units including glazed and hollow shall be in running bond; coursing shall be one unit and one mortar joint to equal 200mm; mortar joints shall be concave.

3.4 PLACING AND BONDING

3.4.1 Lay masonry units with face shell bedding on head and bed joints.

3.4.2 Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

3.4.3 Remove excess mortar as work progresses.

3.4.4 Interlock intersections and external corners.

3.4.5 Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

3.4.6 Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.4.7 Isolate masonry partitions from vertical structural framing members as indicated.

3.4.8 Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler or as indicated.

3.4.9 Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

3.5 REINFORCEMENT AND ANCHORAGE

3.5.1 Install horizontal joint reinforcement every 400mm.

3.5.2 Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 400mm each side of opening.

3.5.3 Place joint reinforcement continuous in first and second joint below top of walls.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.5.4 Lap joint reinforcement ends minimum 150mm.

3.5.5 Install strap anchors at locations where joint reinforcement is not appropriate.

3.6 MASONRY FLASHINGS

3.6.1 Extend flashings horizontally at foundation walls, above ledge angles and lintels, under parapet caps, and at bottom of walls.

3.6.2 Turn flashing up minimum 200mm and bed into mortar joint of masonry seal to seal.

3.6.3 Lap end joints minimum 150mm and seal watertight.

3.6.4 Turn flashing, fold, and seal at corners, bends, and interruptions.

3.7 LINTELS

3.7.1 Install steel lintels as scheduled.

3.7.2 Install reinforced unit masonry lintels over openings where scheduled. Reinforce openings as indicated.

3.7.3 Do not splice reinforcing bars.

3.7.4 Support and secure reinforcing bars from displacement. Maintain position within 13 mm of dimensioned position.

3.7.5 Place and consolidate grout fill without displacing reinforcing.

3.7.6 Allow masonry lintels to attain specified strength before removing temporary supports.

3.7.7 Maintain minimum 200mm bearing on each side of opening.

3.8 GROUTED COMPONENTS

3.8.1 Reinforce bond beam with 2, No. 4 bars.

3.8.2 Reinforce pilaster with 4, No. 5 bars.

3.8.3 Lap splices minimum 24 bar diameters.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

***03 3.8.4 Support and secure reinforcing bars from displacement with bar positioners. Maintain position within 13mm of dimensioned position. *03**

3.8.5 Place and consolidate grout fill without displacing reinforcing.

3.8.6 At bearing locations, fill masonry cores with grout for a minimum 400mm either side of opening.

3.9 CONTROL JOINTS

3.9.1 Do not continue horizontal joint reinforcement through control joints.

3.9.2 Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.9.3 Size control joint in accordance with Section 07900 for sealant performance.

3.10 BUILT-IN WORK

3.10.1 As work progresses, install built-in steel door frames, fabricated metal frames, wood nailing strips, anchor bolts, plates, and other items to be built-in the work and furnished by other sections.

3.10.2 Install built-in items plumb and level.

3.10.3 Bed anchors of steel door and fabricated frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 300mm from framed openings.

3.10.4 Do not build in organic materials subject to deterioration.

3.11 ENGINEERED MASONRY

3.11.1 Lay masonry units with core cells vertically aligned, clear of mortar and unobstructed.

3.11.2 Place mortar in masonry unit bed joints back 6mm from edge of unit grout spaces, bevel back and upward. Permit mortar to cure 7 days before placing grout.

3.11.3 Reinforce masonry unit cores and cavities with reinforcement bars and grout as indicated.

***03 3.11.4 Retain vertical reinforcement in position with bar positioners at top and bottom of cells and at intervals not exceeding 192 bar diameters. Columns and pilasters shall have wire ties wired in position around the vertical steel.**

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.11.5 Wet masonry unit surfaces in contact with grout just prior to grout placement.

3.11.6 Grout spaces less than 50mm in width with fine grout using low lift grouting techniques. Grout spaces 50mm or greater in width with course grout using low lift grouting techniques.

3.11.7 When grouting is stopped for more than one hour, terminate grout 38mm below top of upper masonry unit to form a positive key for the subsequent grout placement.

3.11.8 Grouting: Conform to ACI 530.1/ASCE 6-88 Section 4.

3.12 TOLERANCES

3.12.1 Maximum Variation From Alignment of Columns: 6mm.

3.12.2 Maximum Variation From Unit to Adjacent Unit: 1mm.

3.12.3 Maximum Variation from Plane of Wall: 6mm in 3000mm and 13mm in 6000mm or more.

3.12.4 Maximum Variation from Plumb: 6mm per story non-cumulative; 12mm in two stories or more.

3.12.5 Maximum Variation from Level Coursing: 3mm in 900mm and 6mm in 3000mm; 13mm in 9000mm.

3.12.6 Maximum Variation of Joint Thickness: 3mm in 900mm.

3.12.7 Maximum Variation from Cross Sectional Thickness of Walls: 6mm.

3.13 CUTTING AND FITTING

3.13.1 Cut and fit for chases, pipes, conduit, sleeves and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

3.13.2 Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING

3.14.1 Remove excess mortar and mortar smears as work progresses.

3.14.2 Replace defective mortar. Match adjacent work.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.14.3 Clean soiled surfaces with cleaning solution.

3.14.4 Use non-metallic tools in cleaning operations.

3.15 PROTECTION OF FINISHED WORK

3.15.1 Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

***03 3.15.2 Cover top of walls with nonstaining waterproof covering or membrane when work is not in progress. The covering is to extend down the sides of the wall at least 600mm and be securely anchored in place. Walls must be protected with the covering until the top of walls are sealed with a parapet system or roof.**

***03**

End of Section

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

SECTION 05400
(MDS)

COLD FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Load bearing cold formed steel studs, rafters, and bracing which make up the gabled overbuild areas on the roof of the Training Building.

1.2 Not Used.

1.3 RELATED SECTION:

Section 05311 - Steel Roof Deck

1.4 REFERENCES

1.4.1 AISI - American Iron and Steel Institute - Cold-Formed Steel Design Manual.

1.4.2 ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

1.4.3 ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by Hot Dip Process, Physical (Structural) Quality.

1.4.4 ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

1.4.5 through 1.4.8 Not Used.

1.4.9 AWCI (Association of Wall and Ceiling Industries) - Specifications Guide for Cold Formed Steel Structural Members.

1.4.10 AWS D1.1 - Structural Welding Code.

1.4.11 AWS D1.3 - Light Steel Welding Code.

1.4.12 SSPC (Steel Structures Painting Council) - Steel Structures Painting Manual.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.4.13 MFMA (Metal Framing Manuf. Association) - Guidelines for the Use of Metal Framing.

1.5 SYSTEM DESCRIPTION

1.5.1 Size components to withstand design loads as follows:

1.5.1.1 Vertical Assembly: 20 psf positive and negative lateral load.

1.5.1.2 Horizontal Assembly:

Roof joists: 1.5 kPa (30 psf) live (snow) load; 1.0 kPa (20 psf) dead load; 1.5 kPa gross uplift.

1.5.2 Maximum Allowable Total Deflection: $h/180$

1.5.3 Design roof system to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

1.5.4 Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.6 SUBMITTALS:

Submit under provisions of Section 01330.

SD-01 Data

Product Data; FIO.

Provide data on standard framing members; describe materials and finish, product criteria and limitations.

Calculations; GA.

Provide calculations for loadings and stresses of roof system and connections under the Professional Structural Engineer's seal. Please note that this cold-formed framing system is to be fastened directly to the steel deck below. This fastening must be capable of withstanding all of the loads stated in the Section above.

SD-04 Drawings

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

Shop Drawings; GA.

Indicate component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, and accessories or items required of related work. Indicate stud layout.

Describe method for securing studs to tracks and for framing connections.

1.7 QUALITY ASSURANCE

1.7.1 Calculate structural properties of framing members in accordance with AWCI, MFMA, and AWS D1.3 requirements.

1.7.2 Maintain one copy of each document on site.

1.8 QUALIFICATIONS

1.8.1 Manufacturer:

Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.8.2 Installer:

Company specializing in performing the work of this section with minimum five years documented experience.

1.8.3 Design structural elements under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the place where the Project is located.

1.9 FIELD MEASUREMENTS

1.9.1 Verify that field measurements are as indicated on shop drawings.

1.10 Not Used.

PART 2 PRODUCTS

2.1 MANUFACTURERS

2.1.1 Dale/Incor Industries, Dearborn, MI: Steel Framing

2.1.2 Clark Steel Framing Systems, Cincinnati, OH: Steel Framing

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.1.3 Unimast Incorporated, Franklin Park, IL: Steel Framing

2.2 FRAMING MATERIALS

2.2.1 Studs, Rafters, & bracing, etc: ASTM A446 and A525 rolled steel, channel shaped. Gage shall be as required to meet design loads.

2.2.2 Track: Of same material and thickness as studs minimum.

2.3 Not Used.

2.4 FASTENERS

2.4.1 Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers:

ASTM A123, hot dip galvanized.

2.4.2 Anchorage Devices: Power actuated.

2.4.3 Welding: In conformance with AWS D1.1 and AWS D1.3.

2.5 FABRICATION

2.5.1 Fabricate assemblies of sizes and profiles required; with framing members fitted, reinforced, and braced to suit design requirements.

2.5.2 Fit and assemble in largest practical sections for delivery to site, ready for installation.

2.6 FINISHES: Galvanize to G60 coating class.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Verify site conditions.

3.1.2 Verify that building framing components are ready to receive work.

3.2 ERECTION OF FRAMING:

Install components in accordance with manufacturer's instructions.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.3 ERECTION TOLERANCES

3.3.1 Maximum Variation from True Position: 3mm.

3.3.2 Maximum Variation of any Member from Plane: 3mm.

END OF SECTION

SECTION 02300

EARTHWORK

12/97

AMEND #0003

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

ASTM D 4318

(1998) Liquid Limit, Plastic Limit, and
Plasticity Index of Soils

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, CL, CH. Satisfactory materials for grading shall be comprised of stones less than 200 mm , except for fill material for pavements which shall be comprised of stones less than 75 mm in any dimension.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, CL and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.2.4 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density.

1.2.5 Topsoil

Material suitable for topsoils obtained from offsite areas or excavations is defined as natural, friable surface soil possessing the characteristics of representative soils in the vicinity that produce heavy growth of crops, grass or other vegetation.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-08 Statements

Earthwork; FIO.

Procedure and location for disposal of unused satisfactory material.
Blasting plan when blasting is permitted. Proposed source of borrow material.

SD-09 Reports

Testing; FIO.

Within 24 hours of conclusion of physical tests, 6 copies of test results, including calibration curves and results of calibration tests.

SD-13 Certificates

Testing; FIO.

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

SD-18 Records

Earthwork; FIO.

Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

1.4 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings. The subsoil investigation report is published as a part of the Design Analysis. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

1.5 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.5.1 Rock Excavation

Rock excavation shall include blasting, excavating, grading, and disposing of material classified as rock and shall include the satisfactory removal and disposal of boulders 1/2 cubic meter or more in volume; solid rock; rock material that is in ledges, bedded deposits, and unstratified masses, which cannot be removed without systematic drilling and blasting; and firmly cemented conglomerate deposits possessing the characteristics of solid rock impossible to remove without systematic drilling and blasting. The removal of any concrete or masonry structures, except pavements, exceeding 1/2 cubic meter in volume that may be encountered in the work shall be included in this classification. If at any time during

excavation, including excavation from borrow areas, the Contractor encounters material that may be classified as rock excavation, such material shall be uncovered and the Contracting Officer notified by the Contractor. The Contractor shall not proceed with the excavation of this material until the Contracting Officer has classified the materials as common excavation or rock excavation and has taken cross sections as required. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow ample time for classification and cross sectioning of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

1.5.2 Common Excavation

Common excavation shall include the satisfactory removal and disposal of all materials not classified as rock excavation.

1.6 BLASTING

Blasting will not be permitted.

1.7 UTILIZATION OF EXCAVATED MATERIALS

Unsatisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas. Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No satisfactory excavated material shall be wasted without specific written authorization. Satisfactory material authorized to be wasted shall be disposed of off Government Controlled property and at the Contractor's expense and responsibility.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL AMEND #0003

Where indicated or directed, topsoil shall be stripped to a depth of 150 millimeters. AMEND #0003 Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 50 mm in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be removed from the site.

3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with

the typical sections shown and the tolerances specified in paragraph FINISHING. Satisfactory excavated materials shall be transported to and placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials as directed. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or waste areas located off Government Controlled property at the expense and responsibility of the Contractor. Unsatisfactory excavated material shall be disposed of off Government Controlled property at the Contractor's expense and responsibility. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from other approved areas selected by the Contractor, at his expense and responsibility, and as specified.

3.2.1 Ditches, Gutters, and Channel Changes

Excavation of ditches, gutters, and channel changes shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches and gutters shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 1 meter from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Excavations shall be made to the lines, grades, and elevations shown, or as directed. Trenches and foundation pits shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock or other hard foundation material shall be cleaned of loose debris and cut to a firm, level, stepped, or serrated surface. Loose disintegrated rock and thin strata shall be removed. When concrete or masonry is to be placed in an excavated area, the bottom of the excavation shall not be disturbed. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.3 SELECTION OF BORROW MATERIAL

Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments, fills, and required backfills. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

3.6 BACKFILL

Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, and Section 02630 STORM-DRAINAGE SYSTEM; and Section 02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.7 PREPARATION OF GROUND SURFACE FOR FILLS

3.7.1 General Requirements

Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 150; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

3.8 FILLS

3.8.1 Earth Fills AMEND #0003

Earth **fills** shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 75 mm. The material shall be placed in successive horizontal layers of loose material not more than 150 millimeters in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.9 SUBGRADE PREPARATION

3.9.1 Construction

Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material as directed. Rock encountered in the cut section shall be excavated to a depth of 150 mm below finished grade for the subgrade. Low areas resulting from removal of unsatisfactory material or excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and compacted as specified. After rolling, the surface of the subgrade for roadways shall not show deviations greater than 10 millimeter when tested with a 3 meter straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finish subgrade shall not vary more than 15 mm from the established grade and cross section.

3.9.2 Compaction

Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Except for paved areas, each layer shall be compacted to at least the percent of laboratory maximum density indicated on the pavement details in the contract drawings.

3.9.2.1 Subgrade for Pavements **AMEND #0003**

Subgrade for pavements shall be compacted to at least the percentage laboratory maximum density indicated on the pavement details **in the** contract drawings, for the depth below the surface of the pavement shown.

3.10 FINISHING

The surface of excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 30 mm of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to a smoothness suitable for the application of turfing materials.

3.11 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 50 mm depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 150 mm and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas.

3.12 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompact to meet specification requirements. Tests on recompact areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.12.1 Fill and Backfill Material Gradation

One test per 1500 cubic meters stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance

with ASTM C 136, ASTM D 422 or ASTM D 1140.

3.12.2 In-Place Densities

- a. One test per 1600 square meters, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 100 square meters, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- c. One test per 10 linear meters, or fraction thereof, of each lift of embankment or backfill for roads.

3.12.3 Check Tests on In-Place Densities

If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 as follows:

- a. One check test per lift for each 8300 square meters, or fraction thereof, of each lift of fill or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 500 square meters, of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for each 50 linear meters, or fraction thereof, of embankment or backfill for roads.

3.12.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.12.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1500 cubic meters of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.12.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.13 SUBGRADE AND EMBANKMENT PROTECTION

During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

-- End of Section --

SECTION 02315

EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS
08/98AMEND #0003

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2937	(1994) Density of Soil in Place by the Drive-Cylinder Method
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 DEGREE OF COMPACTION

Degree of compaction is expressed as a percentage of the maximum density

obtained by the test procedure presented in ASTM D 1557, abbreviated as percent laboratory maximum density.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-09 Reports

Testing; FIO.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, CL, and CH and shall be free of trash, debris, roots or other organic matter, or stones larger than 75 mm in diameter.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 75 mm. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

2.1.4 Nonexpansive Soils

Nonexpansive soils shall meet the requirements of Texas Department of Transportation Standard Specification for base course, Item 247, Type A, Grade 1 or 2.

2.1.5 Nonfrost Susceptible (NFS) Material

Nonfrost susceptible material shall be a uniformly graded washed sand with

a maximum particle size of 38 mm and less than 5 percent passing the 0.075 mm size sieve, and with not more than 3 percent by weight finer than 0.02 mm grain size.

2.2 CAPILLARY WATER BARRIER

Capillary Water Barrier shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. The maximum particle size shall be 37.5 mm and no more than 2 percent by weight shall pass the 4.75 mm size sieve.

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING AMEND #0003

The areas within lines 1.5 m outside of each building and structure line shall be cleared and grubbed of trees, stumps, roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences, and other items that would interfere with construction operations. Stumps, logs, roots, and other organic matter shall be completely removed and the resulting depressions shall be filled with satisfactory material, placed and compacted in accordance with paragraph FILLING AND BACKFILLING. Materials removed shall be disposed of outside the limits of Government-controlled property at the Contractor's responsibility.

3.2 TOPSOIL

Topsoil shall be stripped to a depth of 150 millimeters below existing grade within the designated excavations and grading lines and deposited in storage piles for later use. Excess topsoil shall be disposed as specified for excess excavated material.

3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing except as specified, and shall include trenching for utility and foundation drainage systems to a point 1.5 m beyond the building line of each building and structure, excavation for outside grease interceptors, underground fuel tanks, and all work incidental thereof. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with satisfactory material; and payment will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES. Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced, at no additional cost to the Government, with satisfactory materials to the indicated excavation grade; except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations and over-break in rock excavation. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth

excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.4 DRAINAGE AND DEWATERING

3.4.1 Drainage

Surface water shall be directed away from excavation and construction sites to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.4.2 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 900 mm of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 1 meter below the working level.

3.5 SHORING

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

3.6 CLASSIFICATION OF EXCAVATION

Excavation will be unclassified regardless of the nature of material encountered.

3.7 BLASTING

Blasting will not be permitted.

3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 150 mm below the bottom of the pipe, and the overdepth shall

be backfilled with satisfactory material placed and compacted in conformance with paragraph FILLING AND BACKFILLING.

3.9 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained as specified in Section 02300 EARTHWORK.

3.10 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02300 EARTHWORK.

3.11 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. Only excavation methods that will leave the foundation rock in a solid and unshattered condition shall be used. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. Shales shall be protected from slaking and all surfaces shall be protected from erosion resulting from ponding or flow of water.

3.12 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 150 mm before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 150 mm, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 300 mm and compacted as specified for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

3.13 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials.

Satisfactory materials shall be placed in horizontal layers not exceeding 200 mm in loose thickness, or 150 mm when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 600 mm above sewer lines and 300 mm above other utility lines shall be free from stones larger than 25 mm in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 100 mm in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below:

	Percent Laboratory maximum density	
	Cohesive material	Cohesionless material
Fill, embankment, and backfill		
Under structures, building slabs, steps, paved areas, around footings, and in trenches	90	95
Under sidewalks and grassed areas	85	90
Nonexpansive materials	Compacted to not less than 92 percent	
Nonfrost susceptible materials		95
Subgrade		
Under building slabs, steps, and paved areas, top 300 mm	90	95

	Percent Laboratory maximum density	
	Cohesive material	Cohesionless material
Under sidewalks, top 150 mm	85	90
Under nonexpansive and select fill	Compacted to not less than 92 percent	

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein before to the required density prior to further construction thereon. Recomposition over underground utilities and heating lines shall be by hand tamping.

3.14 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or may be performed by the Contractor subject to approval. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. The following number of tests, if performed at the appropriate time, shall be the minimum acceptable for each type operation.

3.14.1 In-Place Densities

In-place density and moisture content test results shall be included with the Contractor's daily construction quality control reports.

3.14.1.1 In-Place Density of Subgrades

One test per 185 square meters or fraction thereof.

3.14.1.2 In-Place Density of Fills and Backfills

One test per 185 square meters or fraction thereof of each lift for fill or backfill areas compacted by other than hand or hand-operated machines. The density for each lift of fill or backfill materials for trenches, pits, building perimeters or other structures or areas less than 150 meters in width, which are compacted with hand or hand-operated machines shall be tested as follows: One test per each area less than 50 square meters, or

one test for each 30 linear meter of long narrow fills, 90 meters or more in length and a minimum of 2 checks per lift for other fill and backfill areas.

3.14.2 Moisture Content

In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D 2216.

3.14.3 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material, including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 150 cubic meters of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density will be made.

3.15 CAPILLARY WATER BARRIER

Capillary water barrier under concrete floor and area-way slabs on grade shall be placed directly on the subgrade and shall be compacted with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.16 GRADING

Areas within 1.5 m outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.17 SPREADING TOPSOIL

Areas outside the building lines from which topsoil has been removed shall be topsoiled. The surface shall be free of materials that would hinder planting or maintenance operations. The subgrade shall be pulverized to a depth of 50 mm by disking or plowing for the bonding of topsoil with the subsoil. Topsoil shall then be uniformly spread, graded, and compacted to the thickness, elevations, slopes shown, and left free of surface irregularities. Topsoil shall be compacted by one pass of a cultipacker, roller, or other approved equipment weighing 1.46 kN/m to 2.34 kN/m of roller. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading.

3.18 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work, shall be repaired and grades reestablished to the required elevations and slopes.

-- End of Section --

SECTION 02763

PAVEMENT MARKINGS

09/98

AMEND #0003

PART 1 GENERAL

1.1 REFERENCES AMEND #0003

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 792	(1991) Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 4280	(1996) Extended Life Type, Nonplowable, Prismatic, Raised, Retroreflective Pavement Markers
ASTM D 4505	(1996) Preformed Plastic Pavement Marking Tape for Extended Service Life
ASTM E 28	(1997) Softening Point of Resins by Ring and Ball Apparatus

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Equipment Lists; GA.

Lists of proposed equipment, including descriptive data, and notifications of proposed Contractor actions as specified in this section. List of removal equipment shall include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and

safety precautions required for the equipment operation.

SD-06 Instructions

Mixing, Thinning and Application; FIO.

Manufacturer's current printed product description and Material Safety Data Sheets (MSDS) for each type paint/color proposed for use.

SD-08 Statements

Qualifications; FIO.

Document certifying that personnel are qualified for equipment operation and handling of chemicals.

SD-09 Reports

Material Tests; FIO.

Certified copies of the test reports, prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

SD-13 Certificates

Volatile Organic Compound (VOC) Content; FIO.

Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

1.3 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

1.4 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Equipment operating on roads and runways shall display low speed traffic markings and traffic warning lights.

1.4.1 Paint Application Equipment

The equipment to apply paint to pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. The machine shall have a speed during application not less than 8 kilometers per hour (5 mph), and shall be capable of applying the stripe widths indicated, at the paint coverage rate specified in paragraph APPLICATION,

and of even uniform thickness with clear-cut edges. Equipment used for marking streets and highways shall be capable of placing the prescribed number of lines at a single pass as solid lines, intermittent lines or a combination of solid and intermittent lines using a maximum of two different colors of paint as specified.. The paint applicator shall have paint reservoirs or tanks of sufficient capacity and suitable gauges to apply paint in accordance with requirements specified. Tanks shall be equipped with suitable air-driven mechanical agitators. The spray mechanism shall be equipped with quick-action valves conveniently located, and shall include necessary pressure regulators and gauges in full view and reach of the operator. Paint strainers shall be installed in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Pneumatic spray guns shall be provided for hand application of paint in areas where the mobile paint applicator cannot be used.

1.4.2 Thermoplastic Application Equipment

1.4.2.1 Thermoplastic Material

Thermoplastic material shall be applied to the primed pavement surface by spray techniques or by the extrusion method, wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of, suitable equipment for heating and controlling the flow of material. By either method, the markings shall be applied with equipment that is capable of providing continuous uniformity in the dimensions of the stripe.

1.4.2.2 Application Equipment

a. Application equipment shall provide continuous mixing and agitation of the material. Conveying parts of the equipment between the main material reservoir and the extrusion shoe or spray gun shall prevent accumulation and clogging. All parts of the equipment which come into contact with the material shall be easily accessible and exposable for cleaning and maintenance. All mixing and conveying parts up to and including the extrusion shoes and spray guns shall maintain the material at the required temperature with heat-transfer oil or electrical-element-controlled heat.

b. The application equipment shall be constructed to ensure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off stripe ends squarely and shall provide a method of applying "skiplines". The equipment shall be capable of applying varying widths of traffic markings.

c. The applicator shall be equipped with a drop-on type bead dispenser capable of uniformly dispensing reflective glass spheres at controlled rates of flow. The bead dispenser shall be automatically operated and shall begin flow prior to the flow of composition to assure that the strip is fully reflectorized.

1.4.2.3 Mobile and Maneuverable

Application equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

The equipment used for the placement of thermoplastic pavement markings shall be of two general types: mobile applicator and portable applicator.

a. Mobile Application Equipment: The mobile applicator shall be defined as a truck-mounted, self-contained pavement marking machine that is capable of hot applying thermoplastic by either the extrusion or spray method. The unit shall be equipped to apply the thermoplastic marking material at temperatures exceeding 190 degrees C (375 degrees F), at widths varying from 75 to 300 mm (3 to 12 inches) and in thicknesses varying from 1.0 to 5.0 mm (0.020 to 0.190 inch) and shall have an automatic drop-on bead system. The mobile unit shall be capable of operating continuously and of installing a minimum of 6 kilometers (20,000 lineal feet) of longitudinal markings in an 8-hour day.

(1) The mobile unit shall be equipped with a melting kettle which holds a minimum of 2.7 metric tons (6000 pounds) of molten thermoplastic material. The kettle shall be capable of heating the thermoplastic composition to temperatures of 195 to 220 degrees C (375 to 425 degrees F).

A thermostatically controlled heat transfer liquid shall be used. Heating of the composition by direct flame will not be allowed. Oil and material temperature gauges shall be visible at both ends of the kettle. The mobile unit shall be equipped with a minimum of two extrusion shoes located one on each side of the truck, and shall be capable of marking simultaneous edgeline and centerline stripes. Each extrusion shoe shall be a closed, oil-jacketed unit; shall hold the molten thermoplastic at a temperature of 195 to 220 degrees C (375 to 425 degrees F); and shall be capable of extruding a line of 75 to 200 mm (3 to 8 inches) in width; and at a thickness of not less than 3 mm (0.125 inch) nor more than 5.0 mm (0.190 inch), and of generally uniform cross section.

(2) The mobile unit shall be equipped with an electronic programmable line pattern control system. The control system shall be capable of applying skip or solid lines in any sequence, through any and all of the extrusion shoes, or the spray guns, and in programmable cycle lengths. In addition, the mobile unit shall be equipped with an automatic counting mechanism capable of recording the number of lineal meters (feet) of thermoplastic markings applied to the pavement surface with an accuracy of 0.5 percent.

b. Portable Application Equipment: The portable applicator shall be defined as hand-operated equipment, specifically designed for placing special markings such as crosswalks, stopbars, legends, arrows, and short lengths of lane, edge and centerlines. The portable applicator shall be capable of applying thermoplastic pavement markings by the extrusion method. The portable applicator shall be loaded with hot thermoplastic composition from the melting kettles on the mobile applicator. The portable applicator shall be equipped with all the necessary components, including a materials storage reservoir, bead dispenser, extrusion shoe, and heating accessories, so as to be capable of holding the molten thermoplastic at a temperature of 195 to 220 degrees C (375 to 425 degrees

F), of extruding a line of 75 to 300 mm (3 to 12 inches) in width, and in thicknesses of not less than 3.0 mm (0.125 inch) nor more than 5.0 mm (0.190 inch) and of generally uniform cross section.

1.4.3 Preformed Tape Application Equipment

Mechanical application equipment shall be used for the placement of preformed marking tape. Mechanical application equipment shall be defined as a mobile pavement marking machine specifically designed for use in applying precoated, pressure-sensitive pavement marking tape of varying widths, up to 300 mm (12 inches). The applicator shall be equipped with rollers, or other suitable compactive device, to provide initial adhesion of the preformed, pressure-sensitive marking tape with the pavement surface. Additional hand-operated rollers shall be used as required to properly seat the thermoplastic tape.

1.4.4 Surface Preparation Equipment

1.4.4.1 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 70.8 liters per sec (150 cfm) of air at a pressure of not less than 620 kPa (90 psi) at each nozzle used, and shall be equipped with traps that will maintain the compressed air free of oil and water.

1.4.4.2 Waterblast Equipment

The water pressure shall be specified at 17.9 MPa (2600 psi) at 60 degrees C (140 degrees F in order to adequately clean the surfaces to be marked.

1.4.5 Traffic Controls

Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

1.5 HAND-OPERATED, PUSH-TYPE MACHINES

All machines, tools, and equipment used in performance of the work shall be approved and maintained in satisfactory operating condition. Hand-operated push-type machines of a type commonly used for application of paint to pavement surfaces will be acceptable for marking small streets and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

1.6 MAINTENANCE OF TRAFFIC

1.6.1 Roads, Streets, and Parking Areas

When traffic must be rerouted or controlled to accomplish the work, the necessary warning signs, flagpersons, and related equipment for the safe passage of vehicles shall be provided.

1.7 WEATHER LIMITATIONS FOR REMOVAL

Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 5 degrees C and rising at the beginning of operations, except those involving shot or sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal.

PART 2 PRODUCTS

2.1 PAINT

The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paints for roads and streets shall conform to FS TT-P-1952, color as indicated. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

2.2 THERMOPLASTIC COMPOUNDS

The thermoplastic reflectorized pavement marking compound shall be extruded or sprayed in a molten state onto a primed pavement surface. Following a surface application of glass beads and upon cooling to normal pavement temperatures, the marking shall be an adherent reflectorized strip of the specified thickness and width that is capable of resisting deformation by traffic.

2.2.1 Composition Requirements

The binder component shall be formulated as a hydrocarbon resin. The pigment, beads and filler shall be uniformly dispersed in the binder resin.

The thermoplastic composition shall be free from all skins, dirt, and foreign objects and shall comply with the following requirements:

Component	Percent by Weight	
	White	Yellow
Binder	17 min.	17 min.

Component	Percent by Weight	
	White	Yellow
Titanium dioxide	10 min.	-
Calcium carbonate & inert fillers	49 max.	*
Yellow pigments	-	*

*Amount and type of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, providing the other composition requirements of this specification are met.

2.2.2 Physical Properties

2.2.2.1 Color

The color shall be as indicated.

2.2.2.2 Drying Time

When installed at 20 degrees C and in thicknesses between 3 and 5 mm, the composition shall be completely solid and shall show no damaging effect from traffic after curing 15 minutes.

2.2.2.3 Softening Point

The composition shall have a softening point of not less than 90 degrees C (194 degrees F) when tested in accordance with ASTM E 28.

2.2.2.4 Specific Gravity

The specific gravity of the composition shall be between 1.9 and 2.2 as determined in accordance with ASTM D 792.

2.2.3 Asphalt Concrete Primer

The primer for asphalt concrete pavements shall be a thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved and/or dispersed in a volatile organic solvent. The solids content shall not be less than 10 percent by weight at 20 degrees C and 60 percent relative humidity. A wet film thickness of 0.10 mm plus or minus 0.025 mm, shall dry to a tack-free condition in less than 5 minutes.

2.2.4 Portland Cement Concrete Primer

The primer for Portland cement concrete pavements shall be an epoxy resin primer. The primer shall be of the type recommended by the manufacturer of the thermoplastic composition. Epoxy primers recommended by the

manufacturer shall be approved by the Contracting Officer prior to use. Requests for approval shall be accompanied with technical data, instructions for use, and a 1 liter sample of the primer material.

2.3 PREFORMED TAPE

The preformed tape shall be an adherent reflectorized strip in accordance with ASTM D 4505 Type I or IV, Class optional.

2.4 SAMPLING AND TESTING

Materials proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at source of supply, sufficiently in advance of needs to allow 60 days for testing. Upon notification by the Contractor that the material is at the site or source of supply, a sample shall be taken by random selection from sealed containers by the Contractor in the presence of a representative of the Contracting Officer. Samples shall be clearly identified by designated name, specification number, batch number, manufacturer's formulation number, project contract number, intended use, and quantity involved. Testing shall be performed in an approved independent laboratory. If materials are approved based on reports furnished by the Contractor, samples will be retained by the Government for possible future testing should the material appear defective during or after application.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water or a combination of these methods as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed with scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion as directed. Areas of old pavement affected with oil or grease shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil-soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

3.1.1 Pretreatment for Early Painting

Where early painting is required on rigid pavements, a pretreatment with an aqueous solution containing 3 percent phosphoric acid and 2 percent zinc chloride shall be applied to prepared pavement areas prior to painting.

3.1.2 Cleaning Existing Pavement Markings

In general, markings shall not be placed over existing pavement marking patterns. Existing pavement markings, which are in good condition but interfere or conflict with the newly applied marking patterns, shall be

removed. Deteriorated or obscured markings that are not misleading or confusing or interfere with the adhesion of the new marking material do not require removal. New preformed and thermoplastic pavement markings shall not be applied over existing preformed or thermoplastic markings. Whenever grinding, scraping, sandblasting or other operations are performed the work must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that is misleading or confusing. When these operations are completed the pavement surface shall be blown off with compressed air to remove residue and debris resulting from the cleaning work.

3.1.3 Cleaning Concrete Curing Compounds

On new Portland cement concrete pavements, cleaning operations shall not begin until a minimum of 30 days after the placement of concrete. All new concrete pavements shall be cleaned by either sandblasting or water blasting. When water blasting is performed, thermoplastic and preformed markings shall be applied no sooner than 24 hours after the blasting has been completed. The extent of the blasting work shall be to clean and prepare the concrete surface as follows:

a. There is no visible evidence of curing compound on the peaks of the textured concrete surface.

b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.

c. All remaining curing compound is intact; all loose and flaking material is removed.

d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.

e. The surface to be marked is dry.

3.2 APPLICATION

All pavement markings and patterns shall be placed as shown on the plans.

3.2.1 Paint

Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 5 degrees C and less than 35 degrees C. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint.

Paint shall be applied pneumatically with approved equipment at rate of coverage specified. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

3.2.1.1 Rate of Application

a.

Nonreflective Markings: Paint shall be applied evenly to the pavement surface to be coated at a rate of 2.9 plus or minus 0.5 square meter per liter.

3.2.1.2 Drying

The maximum drying time requirements of the paint specifications will be strictly enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. If there is a delay in drying of the markings, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

3.2.2 Thermoplastic Compounds

Thermoplastic pavement markings shall be placed upon dry pavement; surface dry only will not be considered an acceptable condition. At the time of installation, the pavement surface temperature shall be a minimum of 5 degrees C and rising. Thermoplastics, as placed, shall be free from dirt or tint.

3.2.2.1 Longitudinal Markings

All centerline, skipline, edgeline, and other longitudinal type markings shall be applied with a mobile applicator. All special markings, crosswalks, stop bars, legends, arrows, and similar patterns shall be placed with a portable applicator, using the extrusion method.

3.2.2.2 Primer

After surface preparation has been completed the asphalt and/or concrete pavement surface shall be primed. The primer shall be applied with spray equipment. Primer materials shall be allowed to "set-up" prior to applying the thermoplastic composition. The asphalt concrete primer shall be allowed to dry to a tack-free condition, usually occurring in less than 10 minutes. The Portland cement concrete primer shall be allowed to dry in accordance with the thermoplastic manufacturer's recommendations. To shorten the curing time of the epoxy resins an infrared heating device may be used on the concrete primer.

a. Asphalt Concrete Primer: Primer shall be applied to all asphalt concrete pavements at a wet film thickness of 0.10 mm (0.005 inch), plus or minus 0.025 mm (0.001 inch) 25-40 square meters per liter.

b. Portland Cement Concrete Primer: Primer shall be applied to all concrete pavements (including concrete bridge decks) at a wet film thickness of between 1.0 to 1.3 mm 30-40 square meters per liter.

3.2.2.3 Markings **AMEND #0003**

After the primer has "set-up", the thermoplastic shall be applied at temperatures no lower than 190 degrees C nor higher than 220 degrees C at the point of deposition. Immediately after installation of the marking, drop-on glass spheres shall be mechanically applied so that the spheres are

held by and imbedded in the surface of the molten material.

a. Extruded Markings: All extruded thermoplastic markings shall be applied at the specified width and at a thickness of not less than 3.0 mm (0.125 inch) nor more than 5.0 mm (0.190 inch).

b. Sprayed Markings: All sprayed thermoplastic markings shall be applied at the specified width and the thicknesses designated in the contract plans. If the plans do not specify a thickness, centerline markings shall be applied at a wet thickness of 2.0 mm (0.090 inch), plus or minus 0.10 mm (0.005 inch, and edgeline markings at a wet thickness of 1.5 mm (0.60 inch), plus or minus 0.10 mm (0.005 inch).

c. DELETED

3.2.3 Preformed Tape

The pavement surface temperature shall be a minimum of 15 degrees C and the ambient temperature shall be a minimum of 15 degrees C and rising. The preformed markings shall be placed in accordance with the manufacturer's written instructions.

-- End of Section --

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

SECTION 07412

(MDS)

NON STRUCTURAL STANDING SEAM METAL ROOF SYSTEM (NSSSMRS)

PART 1 GENERAL

1.1 SECTION INCLUDES

1.1.1 Precoated galvanized steel or aluminum roofing and associated integral flashings.

1.1.2 Board Insulation placed under metal roof system.

1.1.3 Integral gutters and downspouts.

1.1.4 NOT USED

1.1.5 NOT USED

1.2 RELATED SECTIONS

1.2.1 Section 05311 - STEEL ROOF DECK

1.2.2 Section 07900 - JOINT SEALER.

1.3 REFERENCES

1.3.1 ALUMINUM ASSOCIATION (AA)

1.3.1.1 AA ASD-1 (1990) Aluminum Standards and Data

1.3.1.2 AA SAS-30 (DEC 1986; 5th Ed.) Aluminum Construction Manual Series - Section 1
Specifications for Aluminum Structures

1.3.2 AMERICAN IRON AND STEEL INSTITUTE (AISI)

1.3.2.1 AISI SG-673 (1986; Addenda 1989; Errata Nov 30, 1990) Cold-Formed Steel Design
Manual

1.3.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

- 1.3.3.1 ASTM A 463 (1996a) Steel Sheet, Aluminum-Coated, by the Hot-Dip Process (Type 1 and Type 2)
- 1.3.3.2 ASTM A 653 (1996) Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-dip Process
- 1.3.3.3 ASTM A 792 (1995) Steel Sheet, Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
- 1.3.3.4 ASTM B 117 (1994) Salt Spray (Fog) Testing
- 1.3.3.5 ASTM B 209 (1996) Aluminum and Aluminum-Alloy Sheet and Plate
- 1.3.3.6 ASTM C 518 (1991) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- 1.3.3.7 ASTM C 518 (1991) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- 1.3.3.8 ASTM C 991 (1992) Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings
- 1.3.3.9 ASTM C 1289 (1995) Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- 1.3.3.10 ASTM D 226 (1994) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
- 1.3.3.11 ASTM D 522 (1993a) Mandrel Bend Test of Attached Organic Coatings
- 1.3.3.12 ASTM D 523 (1989) Specular Gloss
- 1.3.3.13 ASTM D 714 (1987) Evaluating Degree of Blistering of Paints
- 1.3.3.14 ASTM D 968 (1993) Abrasion Resistance of Organic Coatings by Falling Abrasive
- 1.3.3.15 ASTM D 1308 (1987; R1993) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- 1.3.3.16 ASTM D 1654 (1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
- 1.3.3.17 ASTM D 2244 (1993) Calculation of Color Differences from Instrumentally Measured Color Coordinates

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.3.3.18 ASTM D 2247 (1994) Testing Water Resistance of Coatings in 100 Percent Relative Humidity

1.3.3.19 ASTM D 2794 (1993) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

1.3.3.20 ASTM D 3359 (1995) Measuring Adhesion by Tape Test

1.3.3.21 ASTM D 4214 (1989) Evaluating the Degree of Chalking of Exterior Paint Films

1.3.3.22 ASTM D 4397 (1996) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

1.3.3.23 ASTM D 4587 (1991) Conducting Tests on Paint and Related Coatings and Materials Using a Fluorescent UV-Condensation Light and Water Exposure Apparatus

1.3.3.24 ASTM E 84 (1996a) Surface Burning Characteristics of Building Materials

1.3.3.25 ASTM E 96 (1992) Water Vapor Transmission of Materials

1.3.4 UNDERWRITERS LABORATORIES (UL)

1.3.4.1 UL 580 (1998) Tests for Uplift Resistance of Roof Assemblies

1.3.4.2 Roofing Materials & Systems Directory (2000)

1.4 GENERAL REQUIREMENTS

The Contractor shall furnish a manufacturer's standard product that satisfies the specified design and additional requirements contained herein. The roofing system shall be provided by the Contractor as a complete system as tested and approved in accordance with UL-580. Roof panels, components, transitions, accessories, and assemblies shall be supplied by the same roofing system manufacturer.

1.4.1 Non-Structural Standing Seam Metal Roof System

The NSSSMRS covered under this specification shall include the entire roofing system; the standing seam metal roof panels, fasteners, connectors, roof securement components, and assemblies tested and approved in accordance with UL 580. In addition, the system shall consist of panel finishes, insulation, vapor retarder, all accessories, components, and trim and all connections with roof panels. This includes roof penetration items such as vents, curbs, skylights; exterior gutters and downspouts; eaves, ridge, hip, valley, rake, gable, wall, or other roof system flashings installed and any other components specified within this contract to

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

provide a weathertight roof system; and items specified in other sections of the specifications that are part of the system.

1.4.2 Manufacturer

The NSSSMRS shall be the product of a manufacturer who has been in the practice of manufacturing metal roofs for a period of not less than 20 years and has been involved in at least five projects similar in size and complexity to this project.

1.4.3 Installer

The installer shall be certified by the NSSSMRS manufacturer to have experience in installing at least three projects that are of comparable size, scope and complexity as this project for the particular roof system furnished. The installer may be either employed by the manufacturer or be an independent installer. The installer shall provide proof of membership in either the National Roofing Contractor's Association (NRCA) or Sheet Metal and Air Conditioning National Association (SMACNA) for at least 3 years.

1.5 DESIGN LOADS

Wind uplift pressures are shown on the contract drawings. The NSSSMRS assemblies shall be approved to resist wind uplift pressures of Class 90 as defined in UL-580.

1.6 PERFORMANCE REQUIREMENTS

1.6.1 The Contractor shall furnish a commercially available roofing system manufacturer's product, which satisfies all requirements contained herein and has been verified by load testing and independent design analyses to meet the specified design requirements.

1.6.2 The metal roofing system supplied shall be suitable for the roof slope, the underlayment, and uplift pressures shown on the contract drawings.

1.6.3 Thermal Loads: Roof panels shall be free to move in response to the expansion and contraction forces resulting from a total 82 degrees C temperature range during the life of the structure.

1.7 SUBMITTALS

1.7.1 Submit under provisions of Section 01330

SD-04 Drawings

Metal Roofing; GA.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

Metal roofing drawings, catalog cuts, and specifications and erection drawings; shop coating and finishing specifications; and other data as necessary to clearly describe design, materials, sizes, layouts, standing seam configuration, construction details, provisions for thermal movement, UL Class 90 approval, fastener sizes and spacings, sealants and erection procedures. Drawings shall reflect the intent of the architectural detailing using the manufacturer's proprietary products and fabricated items as required. The NSSSMR system shop drawings shall be provided by the metal roofing manufacturer.

SD-13 Certificates

Roof Panels; GA, Installation; GA, Accessories; GA.

Certificates attesting that the panels and accessories conform to the specified requirements. Certificate for the roof assembly shall certify that the assembly complies with the material and fabrication requirements specified and is suitable for the installation at the indicated design slope. Certified laboratory test reports showing that the sheets to be furnished are produced under a continuing quality control program and that at least five (5) representative samples of similar material to that which will be provided on this project have been previously tested and have met the quality standards specified for factory color finish.

Insulation; FIO.

Certificate attesting that the polyisocyanurate insulation furnished for the project contains recovered material, and showing an estimated percent of such recovered material.

Installer; FIO.

Certification of installer to include proof of NRCA or SMACNA 3-year, minimum, membership. .
Warranties; GA.

At the completion of the project, signed copies of the 5-year Warranty for the NSSSMRS, a sample copy of which is attached to this section, and the 20-year Manufacturer's Material and Weathertightness Warranties.

SD-14 Samples

Accessories; FIO.

One sample of each type of flashing, trim, fascia, closure, cap and similar items. Size shall be sufficient to show construction and configuration.

Roof Panels; GA.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

One piece of each type and finish to be used, 225 mm long, full width.

Fasteners; FIO.

Two samples of each type to be used with statement regarding intended use. If so requested, random samples of screws, bolts, nuts, and washers as delivered to the jobsite shall be taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

Gaskets and Insulating Compounds; FIO.

Two samples of each type to be used and descriptive data.

Sealant; FIO.

One sample, approximately 0.5 kg, , and descriptive data.

1.8 MOCKUP

1.8.1 Provide mockup of standing seam metal roof system, 2400mm long x 1200mm wide, which includes a corner condition, associated attachments, accessories, flashings, joints and junctions, terminating items (roof edge conditions), metal decking and insulation.

1.8.2 Locate where directed.

1.8.3 Mock up must be approved by the Contracting Officer and may not remain as part of the Work.

1.9 DELIVERY AND STORAGE

1.9.1 Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials shall be covered with weathertight coverings and kept dry. Material shall not be covered with plastic where such covering will allow sweating and condensation. Plastic may be used as tenting with air circulation allowed. Storage accommodations for roof covering shall provide good air circulation and protection from surface staining.

1.10 WARRANTIES

The Non-Structural Standing Seam Metal Roof System shall be warranted as outlined below. Any emergency temporary repairs conducted by the owner shall not negate the warranties.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.10.1 Contractor's Weathertightness Warranty

The NSSSMRS shall be warranted by the Contractor on a no penal sum basis for a period of five years against material and workmanship deficiencies; system deterioration caused by exposure to the elements and/or inadequate resistance to specified service design loads, water leaks, and wind uplift damage. The NSSSMRS covered under this warranty shall include the entire roofing system and includes but is not limited to; the standing seam metal roof panels, fasteners, connectors, roof securement components, and assemblies tested and approved in accordance with UL 580. In addition, the system shall consist of panel finishes, insulation, vapor retarder, all accessories, components, and trim and all connections with roof panels. This includes roof penetration items such as vents, curbs, skylights; exterior gutters and downspouts; eaves, ridge, hip, valley, rake, gable, wall, or other roof system flashings installed and any other components specified within this contract to provide a weathertight roof system; and items specified in other sections of the specifications that are part of the roof system. All material and workmanship deficiencies, system deterioration caused by exposure to the elements and/or inadequate service design loads, water leaks and wind uplift damage shall be repaired as approved by the Contracting Officer. See the attached Contractor's required warranty for issue resolution of warrantable defects. This warranty shall warrant and cover the entire cost of repair or replacement, including all material, labor, and related markups. The Contractor shall supplement this warranty with written warranties from the installer and system manufacturer, which shall be submitted along with Contractor's warranty; however, the Contractor shall be ultimately responsible for this warranty. The Contractor's written warranty shall be as outlined in attached WARRANTY FOR NON-STRUCTURAL STANDING SEAM METAL ROOF SYSTEM, and shall start upon final acceptance of the facility. It is required that the contractor provide a separate bond in favor of the owner (Government) covering the contractor's warranty responsibilities will remain effective throughout the five year Contractor's warranty period for the entire NSSSMR system as outlined above.

1.10.2 Manufacturer's Material and System WeathertightnessWarranties

1.10.2.1 The Contractor shall furnish, in writing, the following manufacturer's material warranties, which cover all NSSSMRS components such as roof panels, flashing, accessories, and trim, fabricated from coil material.

1.10.2.2 A manufacturer's 20 year material warranty warranting that the aluminum, zinc coated steel, aluminum-zinc alloy coated steel or aluminum-coated steel as specified herein will not rupture, fail structurally, or perforate under normal atmospheric conditions at the site. Liability under this warranty shall be limited exclusively to the cost of either repairing or replacing nonconforming, ruptured, perforated, or structurally failed coil material.

1.10.2.3 A manufacturer's 20 year exterior material finish warranty warranting that the factory color finish, under normal atmospheric conditions at the site, will not crack, peel, or delaminate; chalk in excess of a

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

numerical rating of 8 when measured in accordance with ASTM D 4214; or fade or change colors in excess of 5 NBS units as measured in accordance with ASTM D 2244. Liability under this warranty is exclusively limited to refinishing or replacing the defective coated coil material.

1.10.2.4 A roofing system manufacturer's 20 year system weathertightness warranty. Warranty shall cover the complete roofing system as defined in paragraph 1.4.1.

PART 2 PRODUCTS

2.1 MANUFACTURER AND PROFILE

2.1.1 Subject to compliance with requirements in this section, provide one of the metal roofing systems listed under Roof Deck Construction No. 303 in UL Roof Materials & Systems Directory.

2.2 ROOF AND FASCIA PANELS

2.2.1 Panels shall be either steel or aluminum and shall have a factory color finish and be formed at the factory. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope when such slope is 9000mm or less. Sheets longer than 9000mm may be furnished if approved by the Contracting Officer. Width of sheets shall provide not more than 457 mm and not less than 300mm of coverage in place. Design provisions shall be made for thermal expansion and contraction consistent with the type of system to be used. All sheets shall be either square-cut or miter-cut. The ridge cap shall not have exposed fasteners. Height of seams shall be not less than 45 mm (1-3/4 inches).

2.2.1.1 Steel Panels: Zinc coated steel conforming to ASTM A 653, aluminum-zinc alloy coated steel conforming to ASTM A 792, AZ 50 coating; or aluminum-coated steel conforming to ASTM A 463, Type 2, coating designation T2 65. Coated roof panels shall be 0.58 mm thick, minimum.

2.2.1.2 Aluminum Panels: Alloy conforming to ASTM B 209, temper as required for the forming operation, minimum 1 mm thick.

2.3 ACCESSORIES

2.3.1 General: Accessories shall be compatible with the roofing furnished and approved by the manufacturer. Flashing, trim, metal closure strips, caps, and similar metal accessories shall be not less than the minimum thicknesses specified for roof panels. Exposed metal accessories shall be finished to match the roof panel color furnished. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the panels and shall not absorb or retain water.

2.3.2 Gutters and Downspouts: Gutters and downspouts shall be fabricated of the same material (including thickness and finish) as the roof panels and shall have a size and shape as indicated. All accessories for the

*** SAFETY PAYS ***

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

complete installation shall be furnished. Accessories shall include gutter brackets, downspout elbows, straps, diamond mesh gutter guards and fasteners.

2.4 FASTENERS

2.4.1 Fasteners for roof panels shall be zinc coated steel, aluminum, or nylon-capped steel, type and size as recommended by the manufacturer to meet the performance requirements and match the roof panel color. Fasteners for accessories shall be the manufacturer's standard. Exposed roof fasteners shall be gasketed or have gasketed washers on the exterior side of the roofing to waterproof the fastener penetration. Washer material shall be compatible with the panels; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 3 mm thick.

2.5 FACTORY COLOR FINISH

2.5.1 Roof panels shall be factory color finished. The factory color finish shall consist of a 70 percent resin polyvinylidene fluoride coating. Color shall be as indicated in Section 09915 Color Schedule. The exterior finish shall consist of a baked on topcoat with an appropriate prime coat. The exterior coating shall be a nominal 0.025 mm consisting of a top coat of not less than 0.018 mm dry film thickness and the paint manufacturer's recommended primer of not less than 0.005 mm thickness. The interior color finish shall consist of a backer coat with a dry film thickness of 0.013 mm, except where interior coat remains exposed it shall have the same finish as the exterior coat. The exterior color finish shall meet the test requirements specified below.

2.5.2 Salt Spray Test: A sample of the sheets shall withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of 10, no blistering, as determined by ASTM D 714; and rating of 6, over 2.0 to 3.0 mm failure at scribe, as determined by ASTM D 1654.

2.5.3 Formability Test: When subjected to testing in accordance with ASTM D 522 Method B, 3mm diameter mandrel, the coating shall show no evidence of fracturing to the naked eye.

2.5.4 Accelerated Weathering, Chalking Resistance and Color Change: A sample of the sheets shall be tested in accordance with ASTM D 4587, test condition D 2000 total hours. The coating shall withstand the weathering test without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with tape in accordance with ASTM D 3359, Test Method B, shall be considered as an area indicating loss of adhesion. Following the accelerated weathering test, the coating shall have a chalk rating not less than No. 8 in accordance with ASTM D 4214 test procedures, and the color change shall not exceed 5 CIE or Hunter Lab color difference (delta E) units in accordance with ASTM D 2244.

2.5.5 Humidity Test: When subjected to a humidity cabinet test in accordance with ASTM D 2247 for 1000 hours, a scored panel shall show no signs of blistering, cracking, creepage or corrosion.

*** SAFETY PAYS ***

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.5.6 Impact Resistance: Factory-painted sheet shall withstand direct and reverse impact in accordance with ASTM D 2794 13mm diameter hemispherical head indenter, equal to 6.7 times metal thickness in mm, expressed in N-meters, with no loss of adhesion.

2.5.7 Abrasion Resistance Test: When subjected to the falling sand test in accordance with ASTM D 968 Method A, the coating system shall withstand a minimum of 50 liters per mil of sand before the appearance of the base metal. The term “appearance of the base metal” refers to the metallic coating on steel or the aluminum base metal.

2.5.8 Specular Gloss: Finished panel surfaces shall have a specular gloss of 30 plus or minus 5 at an angle of 60 degrees when measured in accordance with ASTM D 523.

2.5.9 Pollution Resistance: Coating shall show no visual effects when covered spot tested in a 10 percent hydrochloric acid solution for 24 hours in accordance with ASTM D 1308.

2.6 INSULATION

Thermal resistance of insulation shall be not less than the R-values shown on the contract drawings. R-values shall be determined at a mean temperature of 24 degrees C in accordance with ASTM C 518. Insulation shall be a standard product with the insulation manufacturer, factory marked or identified with insulation manufacturer's name or trademark and R-value. Identification shall be on individual pieces or individual packages. The stated R-value of the insulation shall be certified by an independent Registered Professional Engineer if tests are conducted in the insulation manufacturer's laboratory.

2.6.1 Polyisocyanurate Insulation for Use Above a Roof Deck

Polyisocyanurate insulation shall conform to ASTM C 1289, Type V, having a minimum recovered material content of 9 percent by weight of core material in the polyisocyanurate portion. Insulation shall have a bonded top layer of 11 mm (7/16”) thick OSB and a fiberglass reinforced facer on the bottom. To compensate for aging, maximum design R-value per 25 mm (1”) of insulation for the polyisocyanurate component shall be 0.99 square meters times degree K divided by watts (5.56 hours times square feet times degree F divided by BTU). Insulation shall be Johns Manville “Nailboard”, or equal.

2.6.2 Blanket Insulation

Blanket insulation shall conform to ASTM C 991.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.7 CONCEALED ANCHOR CLIPS

2.7.1 Concealed anchor clips shall have factory punched or drilled holes for attachment. There shall be a minimum of two fasteners per clip. Fasteners shall be anchored to structural metal deck or other structural support below. Fasteners shall not be anchored to nailboard alone, nailboard is used for rigidity only and is not an appropriate means of support for clips.

2.8 SEALANT

2.8.1 Except as stated below, sealants shall be elastomeric type containing no oil or asphalt. Exposed sealant shall cure to a rubberlike consistency and shall match the color of the surface to which it is applied. All sealants shall be the nonhardening type. Manufacturer's recommended primer shall be used prior to applying urethane sealant to surfaces finished with polyvinylidene fluoride.

2.8.2 Roof panel standing seam ribs shall have a continuous sealant that is factory installed.

2.9 GASKETS AND INSULATING COMPOUNDS

2.9.1 Gaskets and insulating compounds shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

2.10 NOT USED.

2.11 EPDM RUBBER BOOTS

2.11.1 Flashing devices around pipe penetrations shall be flexible, one-piece devices molded from weather-resistant EPDM rubber. The boots shall have base rings made of aluminum or corrosion resisting steel that conform to the contours of the roof panel to form a weather-tight seal.

2.12 UNDERLAYMENTS

2.12.1 Felt Layer - Provide minimum 30-pound asphalt impregnated felt layer above all roof areas to receive NSSSMRS before placing ice-dam membranes.

2.12.2 ICE-DAM MEMBRANE - Provide ice-dam membrane over all edges, valleys, ridges, hips and around all openings. Membrane shall be designed for high temperature applications, and shall be Stormguard HT by GAF, Vycor Ultra by Grace or equal.

*** SAFETY PAYS ***

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Installation shall be in accordance with the approved erection instructions and drawings. Dissimilar materials that are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Molded closure strips shall be installed wherever covering sheets terminate in open-end configurations, exclusive of flashings. The closure strip installation shall be weather-tight and sealed. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess of such holes or with such holes in critical locations shall not be used. Exposed surfaces and edges shall be kept clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Stained, discolored, or damaged sheets shall be removed from the site.

3.1.2 Roof Panel Installation: Roof panels shall be installed with the standing seams in the direction of the roof slope. The side seam connections for installed panels shall be completed at the end of each day's work. End laps, where required shall be made over framing members. Fascia panels, closures, flashings, EPDM rubber boots and related accessories shall be installed according to the drawings. Fasteners shall not puncture covering sheets except as approved for flashing, closures, and trim. Exposed fasteners shall be installed in straight lines and shall be permitted only at the rakes, eaves, panel splices, and where required for the attachment of flashings, gutter and other similar accessories.

3.1.3 Concealed Anchor Clips: Roof and fascia panels shall be fastened to roof deck with concealed fastening clips or other concealed devices. Clips shall be attached to the metal deck with bolts or screws. The maximum distance between clips, and the spacing and type of fasteners shall conform with UL580 Class I-90 performance requirements for the specific system to be installed on the project. In no case shall that distance be greater than 1219 mm on center.

3.2 INSULATION INSTALLATION

3.2.1 Insulation shall be installed where indicated in accordance with roof manufacturer's instructions. Rigid board insulation shall be laid in close contact. If more than one layer of insulation is required, joints in the second layer shall be offset from joints in the first layer. A layer of blanket insulation shall be placed over the rigid board insulation to be compressed against the underside of the metal roofing to reduce thermal bridging, dampen noise, and prevent roofing flutter. This layer of blanket insulation shall be compressed a minimum of 50 percent. Rigid insulation shall be attached to the metal roof deck with bearing plates and fasteners, as recommended by the insulation manufacturer, so that the insulation joints are held tight against each other, with no less than **1 fastener and bearing plate per 0.37 square meter** of insulation. Joints shall be tight and sealed. Layout and joint pattern of insulation and fasteners shall be indicated on the shop drawings.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.3 NOT USED.

3.4 UNDERLAYMENTS – Installation methods for all underlayments shall be as recommended by the manufacturers. Installed underlayment shall not be exposed to the elements for a period longer than recommended by the manufacturer. Maximum exposure shall be limited to 30 consecutive days regardless of manufacturer's recommendations. Deteriorated or damaged underlayment shall be replaced.

3.5 GUTTER AND DOWNSPOUT INSTALLATION

3.5.1 Gutters shall be attached as recommended by the manufacturer. Gutters shall have gutter guards attached and lay flat over top of the gutter to prevent the collection of debris in the gutter.

3.6 CLEANING AND TOUCH-UP

3.6.1 Exposed NSSMRS shall be cleaned at completion of installation. Debris that could cause discoloration and harm to the panels, flashings, closures and other accessories shall be removed. Grease and oil films, excess sealants, and handling marks shall be removed and the work shall be scrubbed clean. Exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks. Immediately upon detection, abraded or corroded spots on shop-painted surfaces shall be wire brushed and touched up with the same material used for the shop coat. Factory color finished surfaces shall be touched up as necessary with the manufacturer's recommended touch up paint, using an artist's brush. Panels damaged to the extent they cannot be touched up with an artist's brush shall be replaced.

END OF SECTION

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

**CONTRACTOR'S FIVE-YEAR PENAL SUM WARRANTY
FOR
NON - STRUCTURAL METAL ROOF SYSTEM**

FACILITY DESCRIPTION:_____

BUILDING NUMBER:_____

CORPS OF ENGINEERS CONTRACT NUMBER:_____

CONTRACTOR_____

ADDRESS:_____

POINT OF CONTACT:_____

TELEPHONE NUMBER:_____

OWNER:_____

ADDRESS:_____

POINT OF CONTACT:_____

TELEPHONE NUMBER:_____

CONSTRUCTION AGENT:_____

ADDRESS:_____

POINT OF CONTACT:_____

TELEPHONE NUMBER:_____

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

**CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
NON - STRUCTURAL STANDING SEAM METAL ROOF SYSTEM
(continued)**

THE NON-STRUCTURAL METAL ROOF SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY _____ FOR A PERIOD OF FIVE (5) YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE AND LEAKAGE. THE STANDING SEAM METAL ROOFING SYSTEM COVERED UNDER THIS WARRANTY SHALL INCLUDE BUT NOT BE LIMITED TO THE FOLLOWING: THE ENTIRE ROOFING SYSTEM MANUFACTURER SUPPLIED FRAMING AND STRUCTURAL MEMBERS, METAL ROOF PANELS, FASTENERS, CONNECTORS, ROOF SECUREMENT COMPONENTS, AND ASSEMBLIES TESTED AND APPROVED IN ACCORDANCE WITH UL 580. IN ADDITION, THE SYSTEM PANEL FINISHES, INSULATION, VAPOR RETARDER, ALL ACCESSORIES, COMPONENTS, AND TRIM AND ALL CONNECTIONS ARE INCLUDED. THIS INCLUDES ROOF PENETRATION ITEMS SUCH AS VENTS, CURBS, SKYLIGHTS; INTERIOR OR EXTERIOR GUTTERS AND DOWNSPOUTS; EAVES, RIDGE, HIP, VALLEY, RAKE, GABLE, WALL, OR OTHER ROOF SYSTEM FLASHINGS INSTALLED AND ANY OTHER COMPONENTS SPECIFIED WITHIN THIS CONTRACT TO PROVIDE A WEATHERTIGHT ROOF SYSTEM; AND ITEMS SPECIFIED IN OTHER SECTIONS OF THE SPECIFICATIONS THAT ARE PART OF THE ROOF SYSTEM.

ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE AND LEAKAGE ASSOCIATED WITH THE NON-STRUCTURAL METAL ROOF SYSTEM COVERED UNDER THIS WARRANTY SHALL BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER. THIS WARRANTY SHALL COVER THE ENTIRE COST OF REPAIR OR REPLACEMENT, INCLUDING ALL MATERIAL, LABOR, AND RELATED MARKUPS. THE ABOVE REFERENCED WARRANTY COMMENCED ON THE DATE OF FINAL ACCEPTANCE ON _____ AND WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

(Company President)

(Date)

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

**CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
NON - STRUCTURAL STANDING SEAM METAL ROOF SYSTEM
(continued)**

THE CONTRACTOR SHALL SUPPLEMENT THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE NON-STRUCTURAL METAL ROOF SYSTEM, WHICH SHALL BE SUBMITTED ALONG WITH THE CONTRACTOR'S WARRANTY. HOWEVER, THE CONTRACTOR WILL BE ULTIMATELY RESPONSIBLE FOR THE THIS WARRANTY AS OUTLINED IN THE SPECIFICATIONS AND AS INDICATED IN THIS WARRANTY. EXAMPLE.

EXCLUSIONS FROM COVERAGE

- 1. NATURAL DISASTERS, ACTS OF GOD (LIGHTING, FIRE, EXPLOSIONS, SUSTAINED WIND FORCES IN EXCESS OF THE DESIGN CRITERIA, EARTHQUAKES, AND HAIL).**
- 2. ACTS OF NEGLIGENCE OR ABUSE OR MISUSE BY GOVERNMENT OR OTHER PERSONNEL, INCLUDING ACCIDENTS, VANDALISM, CIVIL DISOBEDIENCE, WAR, OR DAMAGE CAUSED BY FALLING OBJECTS.**
- 3. DAMAGE BY STRUCTURAL FAILURE, SETTLEMENT, MOVEMENT, DISTORTION, WARPAGE, OR DISPLACEMENT OF THE BUILDING STRUCTURE OR ALTERATIONS MADE TO THE BUILDING.**
- 4. CORROSION CAUSED BY EXPOSURE TO CORROSIVE CHEMICALS, ASH OR FUMES GENERATED OR RELEASED INSIDE OR OUTSIDE THE BUILDING FROM CHEMICAL PLANTS, FOUNDRIES, PLATING WORKS, KILNS, FERTILIZER FACTORIES, PAPER PLANTS, AND THE LIKE.**
- 5. FAILURE OF ANY PART OF THE NON-STRUCTURAL METAL ROOF DUE TO ACTIONS BY THE OWNER TO INHIBIT FREE DRAINAGE OF WATER FROM THE ROOF AND GUTTERS AND DOWNSPOUTS OR ALLOW PONDING WATER TO COLLECT ON THE ROOF SURFACE. CONTRACTOR'S DESIGN SHALL INSURE FREE DRAINAGE FROM THE ROOF AND NOT ALLOW PONDING WATER.**
- 6. THIS WARRANTY APPLIES TO THE NON-STRUCTURAL METAL ROOF SYSTEM. IT DOES NOT INCLUDE ANY CONSEQUENTIAL DAMAGE TO THE BUILDING INTERIOR OR CONTENTS THAT IS COVERED BY THE WARRANTY OF CONSTRUCTION CLAUSE INCLUDED IN THIS CONTRACT.**
- 7. THIS WARRANTY CANNOT BE TRANSFERRED TO ANOTHER OWNER WITHOUT WRITTEN CONSENT OF THE CONTRACTOR AND THIS WARRANTY AND THE CONTRACT PROVISIONS WILL TAKE PRECEDENCE OVER ANY CONFLICTS WITH STATE STATUTES.**

REPORTS OF LEAKS AND ROOF SYSTEM DEFICIENCIES SHALL BE RESPONDED TO WITHIN 48 HOURS OF RECEIPT OF NOTICE BY TELEPHONE OR IN WRITING FROM EITHER THE OWNER, OR CONTRACTING OFFICER. EMERGENCY REPAIRS, TO PREVENT FURTHER ROOF LEAKS, SHALL BE INITIATED IMMEDIATELY; A WRITTEN PLAN SHALL BE SUBMITTED FOR APPROVAL TO REPAIR OR REPLACE THIS ROOF SYSTEM WITHIN SEVEN CALENDAR DAYS. ACTUAL WORK FOR PERMANENT REPAIRS OR REPLACEMENT SHALL BE STARTED WITHIN 30 DAYS AFTER RECEIPT OF NOTICE, AND COMPLETED WITHIN A REASONABLE TIME FRAME. IF THE CONTRACTOR FAILS TO ADEQUATELY RESPOND TO THE WARRANTY PROVISIONS, AS STATED IN THE CONTRACT.

**CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY
FOR
NON - STRUCTURAL STANDING SEAM METAL ROOF SYSTEM
(Continued)**

AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE NON-STRUCTURAL METAL ROOF SYSTEM REPAIRED OR REPAIRED BY OTHERS AND CHARGE THE COST TO THE CONTRACTOR. IN THE EVENT THE CONTRACTOR DISPUTES THE EXISTENCE OF A WARRANTABLE DEFECT HE MAY CHALLENGE THE OWNER'S DEMAND FOR REPAIRS AND/OR REPLACEMENT DIRECTED BY THE OWNER OR CONTRACTING OFFICER EITHER BY REQUESTING A CONTRACTING OFFICER'S DECISION, UNDER THE CONTRACT DISPUTES ACT, OR BY REQUESTING THAT AN ARBITRATOR RESOLVE THE ISSUE. THE REQUEST FOR AN ARBITRATOR MUST BE MADE WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED THE PARTIES SHALL, WITHIN 10 DAYS JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES SHALL CONFER WITHIN 10 DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR. IF THE PARTIES CANNOT AGREE ON AN ARBITRATOR, THE CONTRACTING OFFICER AND THE PRESIDENT OF THE CONTRACTOR'S COMPANY WILL STRIKE ONE (1) NAME FROM THE LIST ALTERNATIVELY UNTIL ONE NAME REMAINS. THE REMAINING PERSON SHALL BE THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED ETC., SHALL BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT SHALL PAY FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. A WRITTEN ARBITRATOR'S DECISION WILL BE REQUESTED NOT LATER THAN 30 DAYS FOLLOWING THE HEARING. THE DECISION OF THE ARBITRATOR WILL NOT BE BINDING; HOWEVER, IT WILL BE ADMISSIBLE IN ANY SUBSEQUENT APPEAL UNDER THE CONTRACT DISPUTES ACT.

A FRAMED COPY OF THIS WARRANTY SHALL BE POSTED IN THE MECHANICAL ROOM OR OTHER APPROVED LOCATION DURING THE ENTIRE WARRANTY PERIOD.

END

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

SECTION 07535

**MODIFIED BITUMEN ROOFING
06/95**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 208	(1995) Cellulosic Fiber Insulating Board
ASTM C 728	(1997) Perlite Thermal Insulation Board
ASTM C 1153	(1990) The Location of Wet Insulation in Roofing Systems Using Infrared Imaging
ASTM C 1289	(1998) Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM D 41	(1994) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D 312	(1995) Asphalt Used in Roofing
ASTM D 517	(1992) Asphalt Plank
ASTM D 2824	(1994) Aluminum-Pigmented Asphalt Roof Coatings, Non-Fibered, Asbestos Fibered, and Fibered without Asbestos
ASTM D 3746	(1985; R 1996) Impact Resistance of Bituminous Roofing Systems
ASTM D 4586	(1993) Asphalt Roof Cement, Asbestos Free
ASTM D 4897	(1994) Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing
ASTM D 5147	(1991) Sampling and Testing Modified Bituminous Sheet Material

***** SAFETY PAYS *****

**ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002
FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)**

FM P7825c

(1996) Approval Guide Building Materials

UNDERWRITERS LABORATORIES (UL)

UL-01

(1997) Building Materials Directory

UL 790

(1995) Tests for Fire Resistance of Roof Covering
Materials

UL 1256

(1993; Rev thru Apr 1996) Fire Test of Roof Deck
Constructions

1.2 SYSTEM DESCRIPTION

The modified bitumen roofing system shall consist of a mechanically attached (FM 1-90) layer of polyisocyanurate insulation, a solid-mopped (w/type IV asphalt) layer of perlite insulation, a modified bitumen base sheet, a granule-coated modified bitumen cap sheet, and modified bitumen base flashing. Modified bitumen roofing shall be by Johns Manville, Siplast, or equal. The manufacturer shall have a minimum of 20 years experience in manufacturing of the proposed modified bitumen sheet roofing for similar applications.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Drawings

Modified Bitumen roof layout; GA.

Submit membrane manufacturers roof plan drawing with flashing and installation details.

SD-06 Instructions

Materials and Installation; FIO.

Manufacturer's instructions, including membrane description and performance data, detailed procedure for installation, and safety precautions, prior to the start of roofing work.

SD-13 Certificates

Qualifications; GA.

Evidence that the manufacturer has a minimum of 20 years experience manufacturing modified bitumen roofing. The roofing system installer shall have a minimum of 8 years experience as a licensed approved applicator of the manufacturer's modified bitumen roofing systems. A list of installations using the same products and applicator as proposed shall be included.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

Materials ; FIO.

Certificates of compliance for felts, bitumens, and membrane sheet.

SD-18 Records

Bills of Lading; FIO.

Bills of lading shall indicate the flash point and equiviscous temperature EVT) and this information shall be shown on labels for each unit (or plug) of asphalt.

1.4 STORAGE OF MATERIALS

Felts and roofing sheets shall be kept dry before, during, and after delivery to the site. Felts and roofing sheets shall be stored on end one level high, in an enclosed building or trailer and on platforms, off the deck or floor. Felts and sheets shall be maintained at a temperature above 10 degrees C 50 degrees F for 24 hours immediately before laying.

1.5 COORDINATION REQUIREMENTS

The work shall be coordinated with other trades to ensure that components are available when they are to be secured or stripped into the roofing system.

1.5.1 Insulation

Application of roofing and flashing shall immediately follow application of insulation as a continuous operation.

1.5.2 Flashings

Modified bituminous sheet shall be used for flashings where the roof deck abuts angles, vertical surfaces, edge metal, and penetrations, unless otherwise specified or indicated. Flashing shall be installed as the work progresses.

1.5.3 Sheet Metalwork

Sheet metalwork specified in Section 07620 SHEET METAL FLASHING AND TRIM shall be coordinated with roofing operations.

1.6 ENVIRONMENTAL CONDITIONS

Air temperature shall be above 4 degrees C and there shall be no visible ice, frost, or moisture on the roof deck at the time roofing is installed. When air temperature is less than 4 degrees C, 40 degrees F, kettles shall be insulated, felts and sheets shall be kept warm, and the application site shall be protected.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

1.7 FLAME HEATED EQUIPMENT

Flame heated kettles shall not be placed on the roof. Torch application shall be approved by the membrane manufacturer for the specific modified bitumen. Open flame equipment shall not be left unattended while ignited.

1.8 ELECTRIC-HEATED EQUIPMENT

Adequate electrical service shall be provided as required by the manufacturer of the equipment, to insure proper application of the roofing materials.

1.9 FIRE AND WIND UPLIFT REQUIREMENTS

The complete roof system shall have a UL 1256, UL 790, Class A or B classification, be listed as "fire classified" in UL-01, and bear the UL label. Ratings from other independent laboratories may be substituted provided that the tests, requirements and ratings are documented to be equivalent, to the satisfaction of the Contracting Officer. Roofing system shall have a Factory Mutual wind uplift rating of Class 1-90.

1.10 WARRANTY

1.10.1 Manufacturer Warranty.

Manufacturer's "No Dollar Limit", full system warranty for the roofing system shall be provided for not less than 20 years from acceptance of the work. Warranty shall state that manufacturer shall repair or replace defective materials if the roofing system leaks or allows the insulation beneath the membrane to become wet during the period of the warranty.

1.10.2 Contractor Warranty

Contractor shall provide a warranty against leaks on all sheet metal flashing, counterflashing, scuppers, pitch pans, gravel guards, gutters, conductor heads, downspouts, and any other sheet metal installed in conjunction with the modified bitumen roofing system. Warranty period shall be not less than 5 years, starting from acceptance of the work.

PART 2 PRODUCTS

2.1 PRIMER

Primer shall conform to ASTM D 41.

2.2 ASPHALT

Asphalt shall conform to ASTM D 312, Type IV.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.3 BITUMINOUS CEMENT

Plastic and flashing cements shall be specifically designed for use with SBS modified bitumen roofing membranes and flashing. Cements shall be Johns Manville MBR or equal.

2.4 CANTS AND WOOD NAILERS

Treated wood cants and wood nailers shall be of water-borne preservative-treated material as specified in Section 06114 WOOD BLOCKING AND SHEATHING. Cants shall be made from treated wood or treated fiberboard not less than 89 mm high and cut to reduce change in direction of the membrane to 45 degrees or less. Fiberboard shall conform to ASTM C 208, treated with sizing, wax or bituminous impregnation. When membrane or flashing is to be torch applied, cants shall be fire resistant.

2.5 NOT USED

2.6 MODIFIED BITUMEN SHEET

Modified bitumen sheet shall be a bitumen modified by styrene butadiene styrene (SBS); or modified by SBS which has been further modified with styrene ethylene butadiene styrene (SEBS). Sheets shall be uniform in thickness and off white or gray in appearance, and free from blisters or tape splices. Sheets shall not stick to the roll or stack, and shall be suitable for joining along the entire length by the procedure recommended by the manufacturer. Sheet shall be reinforced with fiber made from glass, polypropylene, or polyester, and shall meet the following requirements:

MODIFIED BITUMEN SHEET PROPERTIES

Maximum Load/Elongation, ASTM D 5147, weakest (longitudinal or transverse) direction:

Maximum load, minimum	15 KN/m
Elongation, minimum; when reinforced with:	
glass fiber	3 percent
polyester or polypropylene	40 percent

Tear Strength, ASTM D 5147

Minimum	356 N
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Low Temperature Flexibility, ASTM D 5147 SBS: minus 26 degrees C

Impact Resistance, ASTM D 3746	No Damage
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***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

MODIFIED BITUMEN SHEET PROPERTIES

Maximum Load/Elongation, ASTM D 5147 weakest (longitudinal or transverse) direction:

Maximum load, minimum	90 lbf/in.
Elongation, minimum, when reinforced with:	
glass fiber	3 percent
polyester or polypropylene	40 percent

Tear Strength, ASTM D 5147

Minimum	80 pounds
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Low Temperature Flexibility, ASTM D 5147 SBS: minus 15 degrees F

Impact Resistance, ASTM D 3746	No Damage
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2.7 NAILS AND FASTENERS

Nails and fasteners shall be an approved type recommended by the roofing felt or membrane manufacturer.

2.8 SURFACING MATERIAL

Base flashing and cap sheet surfacing shall be factory applied granules requiring no further coating.

2.9 ADHESIVE

Adhesive shall be an approved type recommended by the membrane manufacturer.

2.10 WALKWAY SURFACES

Walkway surfaces shall be heavy, mineral-surfaced, modified bitumen sheets or planks specifically designed for use as walkways. Surfaces shall be a minimum of 762 mm (30") wide, 762 mm (30") long, and 6.35 mm (1/4") thick.

2.11 INSULATION

2.11.1 Type I insulation: ASTM C 728, Type 2, expanded perlite mineral aggregate board with the following characteristics:

Board Density:	10 lb/cu.ft.
Board Size:	24" x 48" (600mm x 1200mm)
Board Thickness:	1" (25mm)
R Factor:	2.78 per inch

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

2.11.2 Type II Insulation: ASTM C 1289, Type II, polyisocyanurate, rigid roof insulation with compatible facers for use with mopping grade asphalt and having the following characteristics:

Aged R Value: 5.5 per inch maximum

Size: per manufacturer (48" x 48" or 48" x 96") (1200mm x 1200mm or 1200mm x 2400mm)

Thickness: 3.2" (81mm) min.

2.11.3 Tapered Insulation and Crickets: ASTM C 728, Type 2; expanded perlite mineral aggregate board.

2.11.4 Cricket and Saddle Taper: 1/4 or 1/2 inch per foot minimum where required in plans.

2.11.5 Roof Area Taper: 1/8 or 1/4 inch per foot minimum where required in plans.

2.12 COATING

Aluminum coating shall conform to ASTM D 2824 Type I or III, or shall be as recommended by the membrane manufacturer.

PART 3 EXECUTION

3.1 PREPARATION REQUIREMENTS

The substrate construction of any bay or section of the building shall be completed before roofing work is begun thereon. Vents and other items penetrating the roof shall be secured in position and properly prepared for flashing. Nailers, curbs and other items attached to roof surface shall be in place before roofing is begun.

3.2 INSTALLATION OF CANTS

Cants shall be installed in the angles formed between the roof and walls or other vertical surfaces. Cants shall be laid in a solid coat of bituminous cement just prior to laying the base sheet or membrane. Cants shall be continuous, and shall be installed in lengths as long as practicable.

3.3 CONDITION OF SURFACES

Surfaces shall be inspected and approved immediately prior to application of roofing and flashings. The roofing and flashings shall be applied to a smooth and firm surface free from ice, frost, visible moisture, dirt, projections, and foreign materials.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.4 MECHANICAL APPLICATION DEVICES

Mechanical application devices shall be mounted on pneumatic-tired wheels, and shall be designed and maintained to operate without damaging the insulation, roofing membrane, or structural components.

3.5 PRIMING

Concrete, masonry and metal surfaces to receive bitumen shall be uniformly coated with primer at a rate of not less than 0.4 liter per square meter and allowed to dry.

3.6 HEATING OF BITUMEN

Asphalt shall not be heated higher than 42 degrees C above the EVT or 28 degrees C below the flash point or 274 degrees C (maximum) whichever is lower. EVT and flash point temperatures of asphalt in the kettle shall be conspicuously posted on the kettle. Heating kettle shall be provided with automatic thermostatic control and an accurate thermometer. Kettle operators shall be in attendance at all times during the heating to ensure that the maximum temperature specified is not exceeded. An asphalt tanker shall be treated as a kettle.

3.7 BITUMEN APPLICATION

Asphalt shall be applied within 14 degrees C below or above the EVT, or 204 degrees C, whichever is higher. Application temperatures shall be measured at the mop bucket or mechanical applicator. Bitumen at a temperature below the recommended temperature shall be returned to the kettle.

3.8 INSULATION APPLICATION

Insulation shall be laid in two or more layers. On non-nailable roof decks all areas of steel roof deck shall have one layer of 3.2-inch polyisocyanurate insulation installed with mechanical fasteners (screws and plastic disks) spaced in accord with Factory Mutual I-90 requirements. Factory Mutual requirements shall further be extended to provide compliance with entire roof assembly. Install screw assemblies to "hats" of steel deck only. In multiple layer installations, break and stagger all joints. Solid moppings shall be minimum 25 lb. Per square at proper EVT application temperatures. Install a second layer of 1 inch or tapered perlite in solid mopping of steep grade asphalt to isocyanurate insulation. Mopping rate shall be not less than 25 pounds per 100 square feet at proper EVT for installation of perlite insulation. Where required, install saddles with 1/4" or 1/2" per foot slope, as shown on roof plan instructions, solid moppings of steep or special steep grade asphalt. Lay insulation boards with edges in moderate contact without forcing. Cut insulation boards to fit neatly to perimeters, blocking and around all penetrations. Apply no more insulation than can be sealed and finished with completed surface membranes each day. All cut pieces of insulation shall have not less than 2 mechanical fasteners per piece for first layer application.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.9 MODIFIED BITUMEN MEMBRANE APPLICATION

Membrane shall consist of two plies. The first ply shall be a smooth sheet. The top ply shall be a granular cap sheet. Each sheet in each ply shall be fully adhered to the underlying surface. Sheet edges shall lie flat, with no fishmouths or wrinkles. Installation shall begin at the low point of the roof and progress to the high point with each sheet installed shingle fashion. Each sheet shall be unrolled to provide 100 mm side laps and 150 mm end laps. End laps shall be staggered not less than 600 mm. Laps shall not coincide with laps of base layers except at lines of permanent termination. Sheets shall be embedded in hot solid-mopped asphalt, applied at a rate of 0.97 to 1.46 kg per square meter. Hot asphalt shall flow out of all side and end laps. End laps shall be back-mopped. Roofing granules shall be sprinkled in flow-out asphalt.

3.10 TERMINATIONS AT PERIMETERS

The modified bitumen roof membrane shall extend up wall at least 50 mm above the top of the cant.

3.11 NOT USED

3.12 PROTECTION OF APPLIED ROOFING

At end of day's work or whenever precipitation is imminent, the terminated edge of the roofing shall be sealed with two full width strips of roofing felt set in and coated with bituminous cement or hot mopped asphalt. One half-width of strips shall be extended up and over the finished roofing and the other half-width extended out and onto the bare roof deck or existing membrane. Sealing strips shall be removed before continuing installation of roofing. To facilitate sealing, termination edges may be straightened with pieces of insulation board that shall be removed when work is resumed.

3.13 FLASHINGS

Flashings shall be provided over cants, in the angles formed at walls and other vertical surfaces, and where required to make the work watertight. Modified bitumen flashings shall be used, except where metal flashings are specified in other sections of the specifications. Modified bitumen flashing shall extend up walls at least 203 mm from roof level.

3.14 WALKWAYS

Walkways shall be mineral-surfaced, modified bitumen sheets or planks, and shall be located as indicated on drawings. Sheets or planks shall be installed in a full bed of plastic or flashing cement (whichever is recommended by the manufacturer) in accordance with manufacturer's installation instructions. A minimum of 1-inch open space in all directions shall be left between sheets or planks to provide for drainage of the roofing system.

***** SAFETY PAYS *****

ACCOMPANYING AMENDMENT NO. 0003 TO SOLICITATION NO. DACA63-01-B-0002

3.15 CLEANING

Remove bituminous markings from finished areas and surfaces. In areas where finished surfaces are soiled by asphalt or any other source caused by Work of this Section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

3.16 NOT USED

3.17 NOT USED

3.18 NOT USED

3.19 INSPECTION

The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed roofing with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Inspection shall include, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of roofing workers; start and end time of various tasks; condition of substrate.
- b. Verification of compliance of materials before, during, and after installation.
- c. Inspection of condition of equipment and accuracy of thermometers and metering devices.
- d. Inspection of flashings, cants and curbs.
- e. Inspection of membrane placement, including edge envelopes, widths of starter sheets, laps, proper use of squeegee, and mechanical fastening.
- f. Inspection of application of bitumen, aggregate, and walkways.
- g. Inspection of embedment of aggregate for required weight and coverage.
- h. Cutout sampling and analysis as directed.

End of Section